# AMERICAN MACHINIST

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For Sale Everywhere by Newsdealers.

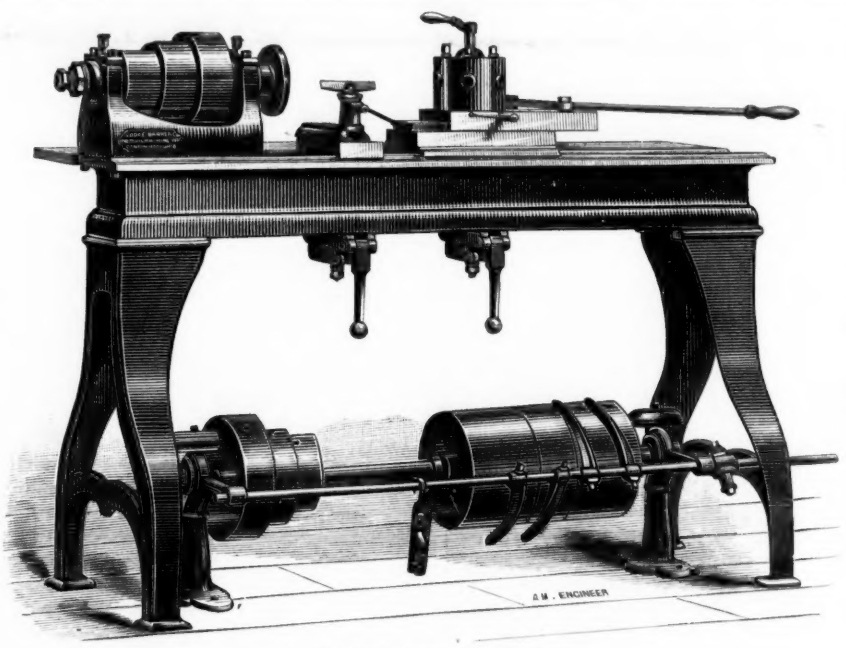
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.


## A New Turret Lathe.

The cut herewith presented represents a 13″ swing turret lathe, manufactured by Lodge, Barker & Co., Cincinnati, Ohio.

This lathe swings thirteen inches, and has five-foot bed. The boxes are made of best bronze, and the spindle is cast steel and hard and uniform. It is two inches in diameter, and pierced with a ¾″ hole its entire length. The cone pulley has three changes of speed for 2½″ belt. The turret slide is operated by a lever, and has a stroke of seven inches. The turret has six holes, is steel bushed, and will allow large die holders to swing clear around the circle. This tool is well adapted for specialties and all chucked work, such as valves, lubricators, and compression cocks, threading and cutting off tubes. It may also be used as a screw machine. The size of hole in spindle may vary to suit the uses required. A cut-off rest with two tools is furnished with the lathe if desired. Countershaft with back and forward motion, wrenches, etc., are furnished with lathe.

The weight of this lathe is 600 pounds.



A NEW TURRET LATHE.

## Cutting Down the Face of Gear Wheels in the Mould—Template for Lessening the Size of the Hub.

BY ROBERT E. MASTERS.

The accompanying drawing illustrates a simple and quick method of cutting down the face of a gear wheel in the mould, which, while practiced by a few, may not be generally known. This plan is also an economical one in making patterns, as a gear wheel pattern 6″ on the face can be used to produce a casting from 3″ to 12″ face, where the same number of teeth, diameter and pitch are required.

In Fig. 1 *A* represents a large gear wheel pattern of 6″ face, the casting to be 4½″ face. After the pattern has been bedded in 4½″ below the level of the floor, strips *a*, 1½″ thick are laid down for the cope to rest on, and the parting made on a level with the top of strips and pattern. After the cope has been rammed up and lifted off, the strips are removed in order to cut down. Fig. 3 shows two views of the strike. A strike made on this plan answers to strike out between the arms, cut down the rim and place the teeth down to the proper depth, secure, so as to avoid a crush. After it has been cut down the mould is sponged, pattern taken out, mould dressed, and closed the same as usual.

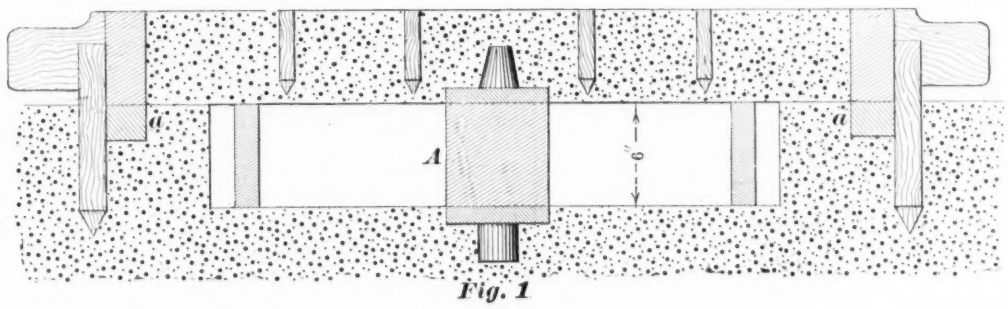



*Fig. 1*

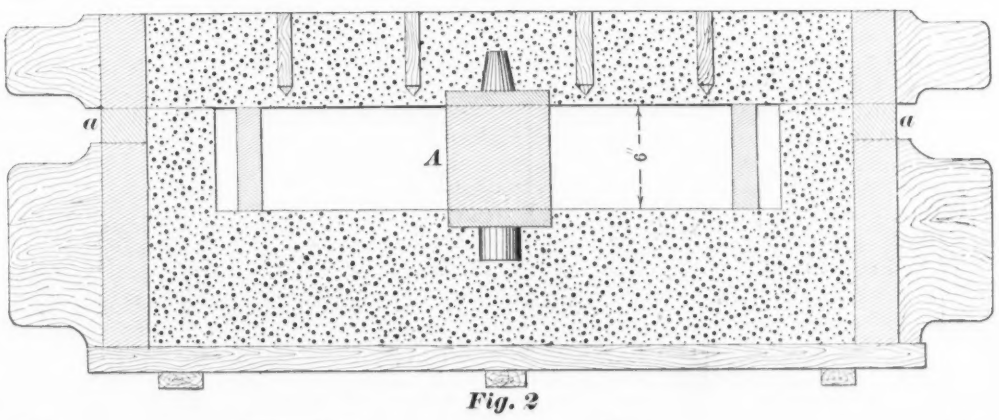



*Fig. 2*

Fig. 2 illustrates moulding a gear wheel on the same general plan in a flask. The pattern is laid on a follow-board, and strips of proper depth placed around for the drag to rest on. After that has been rammed up and turned over, the rest of the work is the same as described for Fig. 1.

Fig. 4 shows a top view of template to lessen the size of large hubs of gear wheels in the mould, in cases where the shaft is small and less iron will answer around the bore than the pattern calls for. After the pattern has been drawn from the sand, the template, which has been made of proper depth, is placed in the mould, arms of template being placed in space left by arms of pattern. Sand is then filled in and secured between the arms and behind the circle of template. The template is then drawn and moved to the next arm, and so continued until the circle of hub and size required has been made.

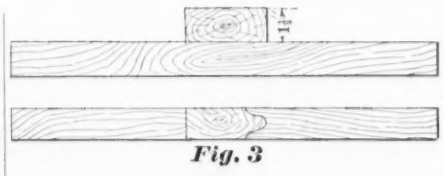


*Fig. 3*

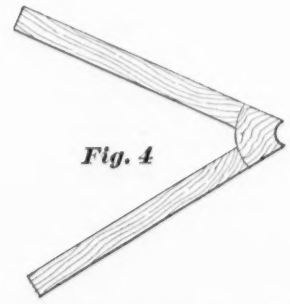


*Fig. 4*

British free trade does not mean the abolition of custom houses, for England raises a large revenue from duties on imports. It is essentially a free trade country because no tariff is levied for protection. Their tariff is for revenue exclusively. A few articles pay duty, among them tea and coffee. In this country tea and coffee are admitted free, and duties are levied upon articles such as are produced or manufactured within our our own borders. British free trade means a tariff exclusively for revenue. Those opposed to a protective tariff can be classified only as free traders. There are several newspapers in this country agitating for British free trade under the shibboleth of "Revenue Reform."

## A Tough Old Engine.

Several years ago the general manager of the elevated railroads of New York agreed to put electric lighting plants into the shops at 98th street if the master mechanic could find an engine to drive it without having to buy one. There was an old engine lying in the shop that had been purchased for some purpose and the master mechanic determined to fix it up to run the electric dynamos. It was an old worn out machine that exhausted into the bed casting, had no makers' name on and belonged to no known type of engine. They bored out the cylinder, took up the lost motion, and set the engine to work running 350 revolutions per minute. Although it looked as if the engine would not stand that speed a week it kept going for two years and then was disabled only by the bed casting bursting.

## To the Master Mechanics' Association.

In our last issue we published a notice of the death of John H. Flynn, president of the Railway Master Mechanics' Association. Regarding the changes entailed by that sad event we have received the following notice:

*Editor American Machinist:*

Please publish the following in your next issue, and oblige the members of the American Railway Master Mechanic Association: Gentlemen, It is with deep pain and regret that we announce to you the death of our beloved President, John H. Flynn, which occurred at his home in Atlanta, Ga., Oct. 1st. By the terms of our by-laws, J. Davis Barnett, the first Vice-President, becomes President, and all communications intended for that officer should be addressed to him at Port Hope, Ontario.

W. WOODCOCK, 2d Vice-Pres.
GEO. RICHARDS, Treasurer,
J. H. SETCHEL, Secretary,
Supervisory Committee.

## How to Retain Good Workmen.

An advertiser in the Electrical Exhibition, in drawing attention to his goods, heads a circular in large letters with the notice "How to retain good workman in a machine shop." This proves an attractive question, and many persons read the notice who would otherwise throw the circular away unnoticed. The gist of the paper is that good tools, and convenient appliances for working with, are the best means for retaining good workmen. He might with equal justice have added that similar means greatly increase the production of a shop, and have the effect not only of keeping the men satisfied with the place, but of providing the owner with the means of paying the men their wages, and of maintaining a balance on the right side of his ledger. When the proprietor of a machine shop gives his men poor tools to work with, he cannot complain at their producing inferior work. Inferior work habitually turned out of a shop soon stamps its character on the establishment, and that entails certain loss of orders. We heard a gentleman, closely identified with extensive machine works, say that it paid him to renew a tool by the time it had been in use ten or twelve years. If more machine shop owners were imbued with this sentiment, there would be fewer tumble-down "old-established" shops around, and the machine business generally would be in a healthier condition.

### Automatic Double Blower Flue Cleaner.

In this flue cleaner the steam is automatically turned on by the pressure caused by its introduction into the end of the flue, which it fits tightly, so that air does not enter to condense the steam. When removed from the flue, as in changing from one to another, the steam is automatically shut off, thus avoiding waste and the nuisance of soot and dirt being blown around.

There are two openings for steam, one central and the other a circular orifice. When pressed lightly in the end of a flue the center blower opens first, blowing all the heavy soot and loose substances out; next the circular orifice opens, blowing against the sides and completing the operation of cleaning. They can be adjusted for any length of boiler.

They are manufactured by J. L. Kelley, 1115 State street, Erie, Pa.

### The Concord Suspended Radial Drill.

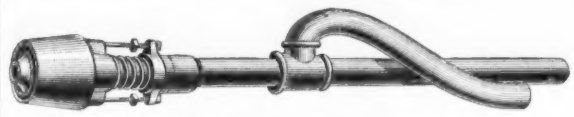
In our issue of May 10, 1884, we gave an illustrated description of this drill, made by Hobbs, Gordon & Co., Concord, N. H. As then illustrated, the machine was arranged to be driven by gearing. The present engraving represents it as made to be driven by belts, the arrangement being seen from the engraving. In other respects, the previous description referred to will apply.

### Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

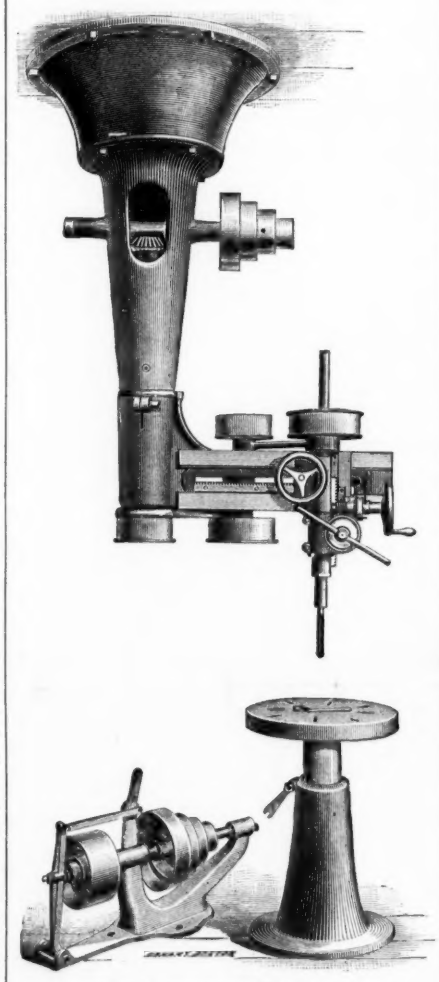
SEVENTH PAPER.

I do not know anything of the oyster supper, as I was too young to be of the party, but I do know that it was a long time before the Commodore again came to the shops. One morning I found him sitting in the office, both Mr. Perkins and father being absent. He was playing with a two-foot rule. He held one end on the table, the middle joint being up. He was sliding the other end back and forth, watching the rise and fall of the toggle. I told him father and Mr. Perkins would soon be in; he said he would wait. He then asked me to observe that, at the angle he held the rule, that when he moved the end he held in his right hand one inch, the middle joint would rise over two inches, but when he lowered the middle joint a push of $\frac{1}{4}''$ would raise it the two inches, but it took a much greater force. He said he had by trial found the angle to place it at, to raise it the distance required with the greatest ease. I could not understand what he was driving at. When Mr. Perkins came in he told him that he had perfected the application of the toggle joint to the capstan, and that it worked to perfection; that he had a carriage waiting to take Mr. Perkins and my father to the navy yard to show them the operation of what he considered his greatest achievement; that this time he was certain he had not been anticipated. I was taken along with them. In the second story of a frame carpenter shop was an old horizontal capstan; on each end a strong ratchet wheel; the capstan rested on a couple of long beams, into which its journals were let about half their diameter. These beams formed the foundation for his contrivance, which consisted of two long-leaved toggles, from the center joint of which hung hooked pawls to operate on the ratchet wheels. One end of the toggles was securely hinged to the beams, the other to a movable guided plunger; these were connected by pitmans to crank arms of a rockshaft that extended from one beam to the other. This shaft was provided with sockets to receive handspikes, one of the crank arms being above, the other below the shaft. There was an arrangement to extend this shaft entirely across the deck of the vessel and give an increased number of sockets and handspikes, by which this shaft was rocked, and as it rocked by its crank arms and pitmans alternately pressed against the ends of the toggles, which, by the rising and falling of their center joints by the hooked pawls, continuously rotated



STEAM FLUE CLEANER.

the capstan. As soon as Mr. Perkins' eye took in the arrangement he said: "Commodore, you are taking hold of the wrong end of the lever." "No," replied the Commodore; "you see what immense leverage I have with my handspikes and the short arms of my rockshaft; I work at short stroke to the best possible advantage of my men, and that wonderful multiplier of power, the toggle joint, gives me so long a lift." "But," said Mr. Perkins, "you are taking hold of it in the wrong place. You had better throw it away and attach your pawls directly to your rockshaft arms." "What!" asked



CONCORD SUSPENDED RADIAL DRILL.

Barron, "give up all the advantage of the toggle that I have seen prove its great power in forcing your copper tubes through the dies?" Father took the Commodore aside, and kindly, with rule and pencil, endeavored to make him understand the priciples of the toggle joint leverage, and so let him down as gently as possible. While this was doing, Perkins was busy attaching a rope to the raised center of the capstan, it being what is called a double one, the center being larger in diameter than the end ratchets. This rope he passed through an opening in the floor under the capstan into the carpenter shop below. He gave this to two men, with directions to hold it steady, and not allow the capstan to turn if only the power of one man was applied above. He arranged signals as to when they were to throw their entire weight on. Barron seemed to understand father's explanations, and he looked very much crestfallen, but, turning to the capstan and taking hold of a handspike, he said: "You see how easily I turn it." But it would not turn. He threw more and more weight on the lever, finally resting his chest on it. When Perkins gave his signal the Commodore was lifted from his feet, struggled for an instant, lost his balance and fell, sitting on the floor as the lever flew up, as completely *hors de combat* as ever was a naval officer. It was a pitiful sight that I have always thought of as a cruel trick; but it has served me many a good turn by relating it to would-be inventors that have come to me with marvelous works, to impress on them the necessity of making themselves acquainted with first principles.

I will give an instance showing the quick working of Perkins' active brain. There was a certain Professor, full of mechanical notions, who was in the habit of coming to the shop to be helped out when in difficulty.

One day father saw him coming, and said to Perkins, "Here comes Doctor, brim full; I will leave him to you." The Doctor explained his difficulty. Perkins said, "Pooh! pooh! that is nothing; do it so," and he rapidly sketched a plan. "That is the very thing. I wonder I did not think of it," said the Doctor, and off he started. But before he had closed the door Perkins called, "Come back, Doctor, and I will show you a better plan." This time the Doctor was delighted, and again started, sketch in hand, but had not got out of the yard before he was again recalled to be shown a still better plan. But this was not the end, for Perkins followed him to the gate, calling after him: "Doctor, if you don't find that to work right, come back, and I will show you a d—d sight better plan than either, which I have this moment thought of." Perkins' favorite expression on the conclusion of any argument was, "Well, we shall see; time proves all things." One of his peculiar traits was, that if any new idea was started, or new thing suggested, that at the time he did not fully comprehend, he would work it into shape and then show it to the suggester as an entirely new thought, not as one perfected by him, but of his own creation. I will relate an instance: After the failure to make a business of the garden engines, a class of engines called "village engines" were built. These carried a suction hose, to be thrown into cistern, creek, or pond, as the case might be. He had returned from delivering one of these engines, and in the evening came to father's house. He complained of having had great trouble from leaks in the leather suction hose. My father proposed substituting folding metallic pipes, and sketched a swivel ground joint, with a single bolt clamping the parts together. He proposed three or four folds, just as is shown in the plate facing page 284 in the second American edition of "Nicholson's Operative Mechanic," with the exception that that is shown with the screw flange to clamp the joint. It is also illustrated with the single clamping bolt as one of Nasmyth's inventions in his autobiography. Father's sketch was complete in all its parts. As Perkins was leaving, according to his common custom, he gathered up all scraps of paper from the table and thrust them into his universal receptacle—the crown of his rather broad-brimmed plug hat. The next morning he came hurriedly into father's office, saying: "Coleman, I have worked out my suggestion of last evening." "What was that!" asked father. "Why, have you forgotten already? Folding copper pipes, instead of our leather suction pipes that have given us so much trouble." He dove into his hat, turning out a lot of sketches; and taking up the one father had made, he explained how simple it was; a single bolt to clamp the joint together. I saw by father's smile that he was more amused than annoyed, but I could not help remarking, "That is the drawing father made last evening." "Is it?" said Perkins; "Why, bless me, can I have made a mistake?" He then rummaged over the contents of his hat, and produced a sketch with the joint made with clamp ring and bolts, evidently his own work. "Coleman, when last evening I proposed folding metallic pipes, you certainly did make this sketch, but it don't look like your work. In the night I thought of using a single bolt, and it is strongly impressed upon my mind that I got up and sketched it, but I have had so much on my mind lately, that at times I don't know what I am at; but we will say no more about this." He crammed the papers into his hat and was off. This was not a solitary case. I know many more like it, yet still believe he was honest and sincere; but on the subject of originating he was not far from being a monomaniac. When father became connected with him he was engaged in other business, and it was agreed that Perkins was to conduct the engine building, father only acting advisory and giving such time and attention as he could spare.

I will now relate what led to his retiring and transferring his interest to Dr. Thomas P. Jones. Patrick Lyon had brought out his greatest fire engine—I think it was called the "Diligence"—with double cylinders, if I recollect right, of 9″ diameter and 11″ or 12″ stroke, with folding levers and out-riggers, and it could be manned with about 60 men. Perkins had seen this engine on its trial, and was seized with the idea that he could excel it. Father was opposed to that kind of rivalry. He had always taken great interest in the independent volunteer fire companies, whose engines Pat. Lyon, with hard knocks, had done more to improve than any other man. Any one visiting the Pennsylvania Academy of Fine Arts can see almost the living Pat. Lyon in Neagle's great picture, as he stands with bare arms and leather apron in the glowing light from the fire on his forge. Father urged that this uneducated workman, having with his own hands, skill, and energy accomplished so much, should rather be helped than competed with. Mr. Perkins remarked that would put an end to all improvements. The matter was supposed to be dropped, but it was not long before it was again opened by Mr. Perkins in a rather singular manner. His ever-active mind had been dwelling much on it. He began by saying that at the trial of Lyon's engine he had observed when the engine was only about two-thirds manned, the stream of water from the nozzle wet the ground to a greater distance than when fully manned. This he attributed only in part to the increased velocity of the water meeting the resistance of the air, separating it into spray. But he had noticed with the increased velocity the crackling noise as the water escaped from the nozzle also increased. He was satisfied that it was caused by expansion of compressed air taken up by the water in its great commotion in the air vessel. To prove this, he had put a bent glass tube from top to bottom of the air vessel of one of his garden engines, in which he could see by the rising of the water how rapidly the air was taken up, and he was surprised to see how soon all the air was exhausted, and the stream became irregular and jerky on the moment of the return of the strokes. He said he had a way of remedying this. He would throw away the air vessel and put in its place an open-top cylinder, with piston and rod and crosshead, with rods extending from it to a series of springs under the engine box. Father asked, why not put a floating piston in a cylindrical air vessel to separate the air from the water, and still use the air above it for the spring to maintain a steady stream. He said he had thought of that, but the piston would be out of sight, and always out of order; the leather cup packing would become dry, the water would pass it, and the spring soon be lost. He said he proposed using a 9″ plunger, with a cylinder double its area, and give from 16″ to 18″ stroke; then, with the same number of strokes per minute, he would throw 50 per cent. more water than Lyon's "Diligence." Father asked him how he proposed to arrange levers to man them to give so great a length of stroke? His reply was: "Bless you, I don't intend to use levers at all. I have been blamed enough for using Lyon's, or rather Adam Echfeldt's, folding levers on *my* village engines. I shall dispense with them altogether, and in doing so with a great weight." He then went on, saying: "Imagine a bell crank with a pendulum arm and a shorter arm at right angles that takes hold of the pitman that is attached inside to the lower end of the plunger; to the pendulum arm ropes that could be manned with any number of men." He only gave this as an illustration, for he did not intend directly to take hold of the pendulum, but on each side of its axis he would have a cylinder or drum, whose radius should be equal to its length; on these drums he would coil ropes having wooden cross-handles about three

feet apart, so that the rope would be manned with two men at each handle. When sufficient rope was let out, the drums would be clamped to the pendulum arm, the ropes running out, one at each end of the engine, and from the bottom of the drums alternate pulls would swing the pendulum and operate the pump. In places where there was not sufficient room to run out these long ropes, a single-tree attached to it, with ropes at each end, would give three ropes, with six rows of men to man them. On being asked how he expected to take from the crowd men and boys who would make the alternate pulls in harmony, he replied: That was easy. In the first place the members of the company would be trained; besides that, he proposed to have a stand or a seat, alongside of the gallery on which the men stand to manage the branch pipe, for a foreman, leader or conductor in sight of all the men manning the ropes; this leader would wave a conspicuous baton, and at the same time have a ringing call, like the boatswain's call to the men when hauling a line, that would soon bring the alternate pulls in harmony. This plan was for low-bodied engines, where the ropes would be over the top of the water box. For high mounted engines on springs, he would use but one broad-faced wheel or cylinder, placed horizontally under the body of the engine; the motion transferred to rock-shaft by bevel wheels; on this plan he would have two alternating ropes at each end of the engine, and two at each side—eight in all—giving four at each alternate pull. My father, who had not the most distant idea that Perkins was in earnest, laughed, and said he had expended much ingenuity, and he would like to know how he expected to hold his engine with all his pulling and tugging? Perkins replied: That is provided for by radial bars from each axle, with shoes or scotch blocks that would be dropped, wedging under and securing all the wheels; besides this, he should have an extending steel-pointed rod from each corner of the engine against the ground. On father bantering him on the waste of thought on such a picture, Mr. Perkins very triumphantly drew from his hat a contract signed between Perkins & Sellers and a newly organized fire company, in which P. & S. agreed to build, within a certain time, a fire engine that would throw more water than the new "Diligence," and so much farther as to completely wet the ground where, on competitive trial, the Diligence's last drop should fall; and on these conditions being complied with the company were to take the engine, paying a certain price. This put a serious face on the matter, and decided father to retire, which he had a right to do at the expiration of a year, or sooner, on finding an acceptable person to take his place. Dr. Jones was such, but he could not take hold before the expiration of the year, and before that time the great engine was completed. Its high-arched gallery and uncouth shape had, among the boys, got it the nickname of the "hunchback," that soon settled to the "Perkins Dromedary." When everything was ready for the trial, Perkins, baton in hand, mounted his perch. The ropes were drawn taut, the signal given; a few slow pulls followed the motion of the baton, when the pressure of the escaping water at the nozzle began to be felt. "The fun grew fast and furious;" the men and boys, shouting, tugged at the ropes; the engine reared and jumped about; the men at the branch pipe fell on their knees, grasping the sides of the gallery; Perkins shouted and screamed to the men to stop; he was neither heard nor heeded. In less time than it takes to tell it he was thrown from his perch and badly bruised; but he was a man of indomitable will and perseverance, and would never acknowledge defeat. He said that on that day week he would have another trial; that by that time everything would work right. He had already conceived the changes he would make. He would attach a square pole a little longer than the engine body at its center to the lower end of his bell crank pendulum. He would make arrangements to carry on the engine eight poles, each twelve feet long; these he would connect by socket and key, four at each end of the engine; these, with his cross-handles, he could man with 100 men. Each pole was provided with a pair of spreading steel-pointed supporting legs, jointed to the pole, the motion to be like a standing rower. By this arrangement the men would be compelled to work in concert, the same as with common levers. The advantage over the ropes would be that every man could exert some power to push as well as pull. The changes were made; the day of trial came; a great crowd collected to witness it; a few swings of the poles and pendulum and a solid stream of water came from the nozzle, looking like a stick of black glass, without any of the ordinary crackling noise, and the ground was thoroughly wet fully 20 feet beyond any previous record from the same size nozzle. Perkins was almost beside himself; urged the men who partook of his enthusiasm, and they thrust and pulled with all their power, lengthening their stroke until the engine jumped its chocks and was jerked back and forth so furiously that the two men at the branch pipe lost their hold, which, by the force of the stream and bend of the goose neck, went flying around, deluging with water the crowd of lookers on. In the excitement of the men at the pole one end of it was jerked up, and with it the rocking supporting legs, one of which, steel-pointed, as they went down pierced through a boy's foot, pinning it to the ground. This mishap had more effect on Mr. Perkins than a total failure of his engine would have had, for he was a kind, tender-hearted man. The boy was a novitiate, who swung the censer in one of the Roman Catholic chapels, and who, years after, when a priest in Cincinnati, spoke to me feelingly of Mr. Perkins' great kindness and attention to him while laid up with the wound that had lamed him for life.

The "Dromedary" was run under a shed and never brought out again. It was finally dismantled, a regular air vessel replacing its spring piston. It was sold as a stationary mill engine to a cotton factory, to be worked by water-power.

## Notes of West Albany Machine Shops.

On reaching the top of the heavy grade ascended by the New York Central Railroad, going westward from Albany, we reach a whole town of buildings devoted to the repair and machinery building of the road. It was a wise action, locating the mechanical headquarters of the road out here, where there was ample room for extension, and the convenient arrangement of the buildings shows a strong contrast with many large railroad shops crowded within large city limits.

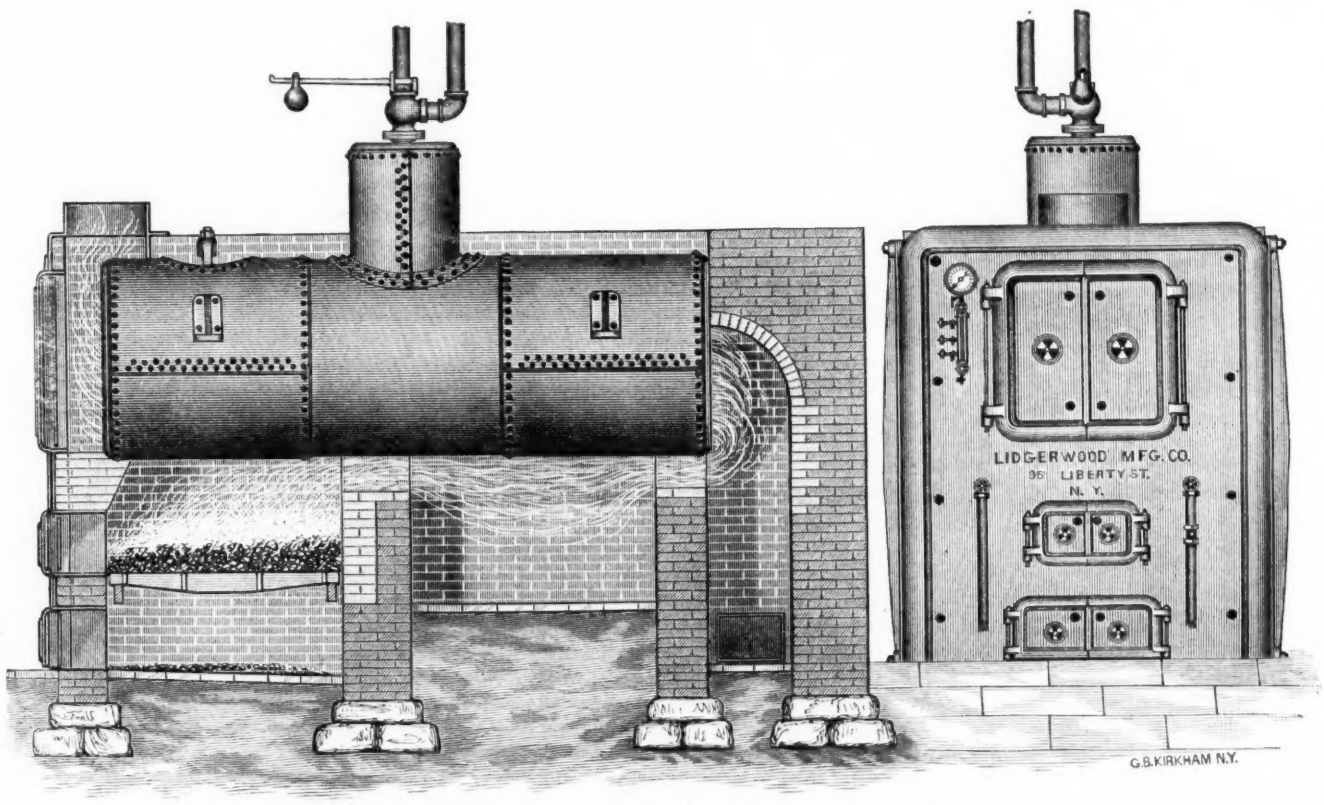
In the course of a recent visit, we were favorably impressed with the numerous improvements that had been made within the machine shops in the last year, and we think Mr. John Ortton deserves much credit for the excellent work done under his directions. Quite a number of new standard tools have been put in to replace those that have become antiquated, and this work is still progressing, for Mr. Buchanan believes in the policy of giving men first-class tools to work with before expecting good work from them. Among the new tools, we observed several turret lathes, milling machines, and a boring mill. For the use of the boiler shop, there is also a new sheet planer and a steam riveting machine.

There are fifteen engines in the erecting shop undergoing repairs, some of them receiving work equal to rebuilding. They are working steadily on the line of making work interchangeable, and this policy exercises a strong influence on the work of repairs. The road has inherited so many locomotives of odd sizes and shapes, that it is an intensely difficult matter to reduce them all within the scope of standards, but this is done as far as it can be carried out without incurring excessive expense. They went to considerable expense by turning a great number of engine and tender trucks of odd forms into the scrap heap and replacing them by standard interchangeable trucks, and the reform is already giving good returns, by reducing the expense of repairs. All other parts of the running gear are being reformed in a similar way, which has already resulted in a remarkable reduction of the sizes of springs carried in stock. Steel castings are used to a great extent on this company's rolling stock, and they have proved very satisfactory in service.

Guides, cross-heads, piston spiders, rocker arms, and links are among the parts now made from mild steel castings, and for all these purposes they stand strains without breakage, and wear remarkably well. A practice is rigidly followed of dating every new article put on an engine, and certain parts are removed when they have been in service for a certain mileage. Side rods and axles are permitted to have a comparatively short life on fast passenger locomotives, before they are transferred to freight or slow-running passenger engines. The safety of running gear is the subject of peculiar solicitude in the shops of this road. All axles are made with a wide margin of safety, the truck connections are unusually heavy, and excellent wrought-iron wheels of a British pattern have been made standard for engine and tender trucks.

In these shops all scrap metal is worked up into new form. Two heavy steam hammers are kept working up scrap iron, which is carefully selected for the intended purpose. This must have been carried out with great care, and the process of working up the selected scrap well carried out, for although a certain percentage of all axles turned out are regularly subjected to the drop test, none of them have ever broken under it.

The tool-room is equipped with the most approved standard gauges, and there is a fine collection of taps, dies, and reamers. While we were admiring the excellent condition in which the tools in this room were kept, Mr. Ortton said that he found fine tools were easier kept than rough ones, for the workmen were much more careful in using the former. Although in these shops the policy of doing their own work is well carried out, they find it better and cheaper to buy tools of precision from those who make their production a specialty. They also buy all their springs from good makers.




Design of Boiler Front and Setting of a Horizontal Tubular Boiler.

## Horizontal Tubular Boiler and Setting.

The engraving represents the style of tubular boiler, together with front and fittings, made by the Lidgerwood Manufacturing Company, 96 Liberty street, New York; also the setting which has been found, in practice, to give good results. These boilers are of good design, made from standard brands of stock, and workmanship throughout fully guaranteed. The front is neat and plain, easily kept clean and not liable to crack or warp. All necessary fittings and iron work are furnished.

Benjamin W. Grist, Reading, Pa., has obtained a patent on an improvement for a double-cylinder steam engine. The inventor proposes to place two upright cylinders side by side on the same frame, and supply steam to both cylinders from a steam chest located between them. Inside this chest a double balanced D valve is operated by one eccentric, and is designed so that it will distribute the steam for both cylinders to trunk pistons, which transmit the power. Steam is admitted only to the top of the cylinders, and the under part is open to the atmosphere. We presume the engine is intended for high speed. The cranks are set at right angles to each other.

## LETTERS FROM PRACTICAL MEN.

### Compound Locomotives.

*Editor American Machinist:*

The letter from "J. T. M.," in your issue dated October 4, on the above subject, was most interesting, but I should like to ask something further. The current reports differ considerably from his account of the running of these engines, and I, for one, should feel glad if he could settle a few doubts. In casual conversation I have understood that considerable trouble has been experienced with hot driving boxes, also that the engines were excessively rough-riding on the foot-plate at ordinary speeds (of course the front end, with a truck, is usually easy-riding) and shakes to such an extent that the drivers prefer standing on the tender, but of course it is difficult to give some of these assertions full credence.

As "J. T. M." seems to have had some opportunities for observation, perhaps he could give an average sample of the monthly repair account for running, which would go far to settle these questions.

I understand that these engines are only run by the most experienced men, carefully selected for their record, and under close supervision; these men having been for many years trained to coal saving under the premium system.

Trouble is also sometimes experienced in getting away from a station, the engine not being able to "lift" her train, and should expect such would be the case where the low-pressure cylinder is on a dead center, as then the small cylinders have to do the work, for the moment, of probably a pair 17″ diameter, and it may be that one of those is also on the center. Can "J. T. M." explain the *modus operandi* of getting away in such cases?

With regard to the crank axle, I do not see that any trouble should be anticipated, being only single throw and the bearings of ample length. I feel quite certain that a very narrow bearing in the center of a double-crank axle would effectually prevent a great deal of the trouble now experienced with them, as at present it admits of the central portion being moved bodily out of the center line.

Your correspondent does not express himself very clearly, in saying that he "knows of only one engine here [in England] which is doing about the *same* work with the *same* fuel consumption," and a few sentences further asserting that the compound engine is twenty per cent. more economical.

I had the pleasure of being shown through the works at Crewe some time ago, and was fully impressed with the signs of "a strong personality at the head of the establishment," as "J. T. M." expresses it, but I understood that the Westinghouse brake was not used on account of its cost of application. On this subject, and referring to the late accident at Penistone, near Sheffield, I fully believe that had the driver not reversed his engine, as was stated, it would not have left the track, and if he had had the Westinghouse automatic brake on the train he would not have reversed. Lead.

Montreal, Canada.

[Our correspondent is wrong in assuming that J. T. M. wrote from England. The allusion is made to American locomotives.]

### Boiler Explosions.

*Editor American Machinist:*

In your issue of October 4th you illustrate the Lawson boilers, and quote quite liberally from the prospectus of the makers. It is not my purpose to condemn this system of boiler construction, but rather to discuss what I believe to be serious defects. From the fact that the inventor of this boiler exploded one or two under studied conditions, he seems to jump at the conclusion that all explosions, or nearly all, are from the same cause, and that they may be prevented by the introduction of means to mechanically prevent the conditions he seeks to avoid. That boilers can be exploded under such conditions there is no doubt, but that these conditions ever exist in actual practice is extremely doubtful.

This invention seems to be simply the introduction of a perforated diaphragm between the steam and water spaces of shell boilers, the aggregate openings to be slightly less than the area of the valve port. In other words, an obstruction is provided against the too rapid escape of steam. To guard against a possible danger, the ever present source of one is introduced.

A diaphragm placed in the position shown must have, even under slight variation of pressure, an immense leverage on the sides of the boiler to which it is attached, and the continual variation to which it would be subjected must have a tendency to develop fractures or grooving.

If all existing boilers were provided with this invention, I fear you would not be called upon to record any less disastrous explosions than at present.

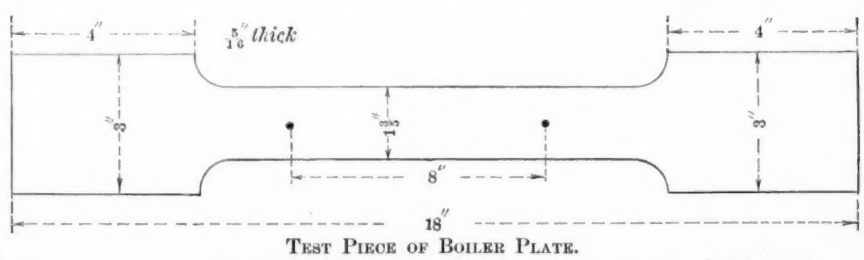
P. H. Bullock.

Warnerville, Mass.

### Test of Boiler Plate After Thirty Years' Use.

*Editor American Machinist:*

The question sometimes arises whether or not the shell of a locomotive boiler deteriorates by use. The test described below will perhaps throw some light upon the subject. In 1868 the Baldwin Locomotive Works, of Philadelphia, overhauled a boiler, which at that time was reported to have been in use for fifteen years. It was purchased and put in use at their works, and remained in use for fifteen years, making a total usage of thirty years. We determined to make a test of a piece of iron cut from the shell of the boiler. The piece was cut from immediately behind the tube sheet, at the smoke-box end of the boiler. That it was a part of the original shell was proved by the fact that in that part of the sheet used as a fire-box, the holes still remained through which the exhaust pipes had passed when the boiler was in use for a locomotive engine. The test piece was cut from that part of the sheet which formed a part of the boiler, and not from that part which was used as fire-box. From this piece two sample test pieces were cut, of the form shown above.




Test Piece of Boiler Plate.

The pieces were tested in a Riehle machine. The following is a report of the tests:

| | No. 1. | No. 2. |
|---|---|---|
| Elastic limit per sq. inch | 25,000 lbs. | 29,000 lbs. |
| Breaking strain per sq. inch of original area | 51,000 lbs. | 49,000 lbs. |
| Breaking strain per sq. inch of fractured area | 66,700 lbs. | 75,100 lbs. |
| Reduction of area | 23½% | 35½% |
| Elongation in 8″ | 14½% | 19½% |
| Original length between witness marks | 8″ | 8″ |
| Length after test | $9\frac{5}{32}$″ | $9\frac{9}{16}$″ |

The above seems to indicate that a boiler may be used for thirty years without injury to the iron. It is worthy of note, also, that two test pieces cut from the same piece of iron should show so much difference in elasticity. R. H. Davies, Master Mechanic.

Phœnix Iron Works, Phœnixville, Pa.

### Rectangular Nozzles.

*Editor American Machinist:*

In your paper of October 11, Ralph E. State asks for information on the advantage claimed for the oblong form of nozzles used by the Pennsylvania Railroad Company. I came across this matter practically three years ago by the company I worked for purchasing old locomotives that had rectangular nozzles. The engines steamed poorly, and my attention was at once drawn to the discrepancy in form between the nozzles and the smoke-stack. Believing that the flow of gases through a smoke-stack is regulated by the same laws as control them in any other channel, I concluded that the stacks of these engines must be made rectangular or the nozzles round. As round stacks were my standard, I changed the nozzles to the same form with satisfactory results. But I have always believed that I might have obtained the same end of making steam freely by adopting a rectangular stack. Although I did not reduce my theory to practice, I consider it perfectly good, and that the only advantage of oblong nozzles is that the novelty of a rectangular stack can be used to advantage along with them. M. M.

### A "Gun" for Driving or Backing-Out Heavy Keys.

*Editor American Machinist:*

A very neat and effective device for this purpose has been made for use on the boats of the International Steamship Company, at Portland, Maine. This is simply a breech-loading cast-iron gun of 2½″ diameter and 9″ length of bore, to which is fitted, with proper allowance for windage, a hardened steel plug 5″ long. The body of the gun is 8″ diameter, and 12″ long, and is handled, or slung in place, as required, by four ⅞″ eye-bolts tapped into it, two near each end. The breech piece is a straight pin, 1¼″ diameter, with a wrench handle welded to the upper end, by which, after the pin has been dropped into place, it may be turned round and locked by a lip which is thus wedged under a heavy lug cast on the body of the gun. The hole for the breech piece or pin is drilled across the inner end of the bore of the gun, and far enough beyond the bore to give a firm bearing for the pin.

This pin has a powder chamber cut in one side of it, opposite the bore, ⅝″ diameter and 2″ long, and a vent is drilled through the pin to the outer end. A rough cartridge is made to suit this chamber, and it is fired by a common friction primer. Near the nozzle of the gun four ½″ holes are drilled, leading from the bore radially outward, and pointing a little forward to the muzzle. These holes are set far enough back from the muzzle to permit the gas to escape, and thus to relieve the pressure after the plug has passed them, and projects one or two inches from the muzzle, this retaining of the plug within the bore being needful to prevent it from being lost. The weight of the whole is quite sufficient to prevent any serious recoil, and the exact distance which the plug shall be permitted to project in any given case can be readily confined to the required limit by lashing or blocking the gun to the shaft or the crank, or other similar part upon or near which it may be used. One side of the gun is flattened near the muzzle so that the plug may be shot downward, if required, at a slight angle against the end of the key. This permits the plug to strike directly upon a thin key, without the use of a drift of any kind, when, as often happens, a key is to be driven at a distance from the end of a shaft.

It will be seen that this whole contrivance can be set or hung almost anywhere in or around any engine or other piece of machinery, where it is needful to put in or take out a key, and that a distance of 13″ in front of the end of the key is amply sufficient for its convenient and effective use. A gun of the size described will start readily, moving it ⅛″ at a blow, a key which has been driven solid in the ordinary way with a 14-pound sledge.

The use of a gun in this particular case was due to the suggestion of Mr. Taylor, chief engineer of the Steamship Company, and it was developed and put into use by Mr. Flanders, for many years foreman at the Portland Locomotive Works. R.

### Losing Our Tempers.

*Editor American Machinist:*

Happy is the workman who, always calm, temperate and wise, views with philosophic eye the accidents and misfortunes which come to him as if they were matters of course.

It is the suddenness with which a mistake appears to us, a bolt breaks, or a hammer flies off the handle, that upsets our equanimity and makes us act in a manner of which we are afterward ashamed.

It is not the sluggish, indifferent workman who is most liable to this fault; it is the quick, active man, who wants to get along with his work and do something of some account, who needs to bring the strong will power, which such men usually have, to bear against this fault of getting in a pet. It is a habit—a bad habit—and will grow upon us if we will let it. I have no sovereign remedy to prescribe; only, don't do it. And, in this, I may be as much a finger-board as the "Old Man" Morton was when he took Johnny Curran from the shop to testify in court. The opposing counsel was noted for bullying witnesses, and Morton told Johnny not to get angry at anything the lawyers said. On cross-examination, the first question asked of Johnny was, "What wages do you get?" "None of your business!" shouted Morton, in a tone that meant business, and it took the full authority of the Court to restore order.

"We boys" had a great laugh at the old man's expense, but it well illustrated the soundness of the advice which he had often given us, "Never act while in the heat of passion, but wait until the storm has blown over." Old Jour.

### Removing Foreign Substances from the Eye.

*Editor American Machinist:*

I have seen several suggestions in your paper in regard to removing foreign substances from the eye, such as iron rust, chips and emery dust, which imbed themselves in the ball of the eye. Having emery dust in my eye, an old English machinist said I need not go to a doctor, as he could remove it. He took a pin from his vest and flattened it, and went at the job. It saved me many a dollar. Any one can use it who has nerve, for he need not be afraid of scratching or cutting the eye. That was fifteen or sixteen years ago, and I have taken out hundreds of pieces since with success. There is danger in using a knife, for a wink would cut the lid or eye-ball. You can close the eye with the pin in it and not get cut. Moulder.

### Cutting off Water-Gauge Glasses.

*Editor American Machinist:*

None of the several methods for cutting water-gauge glasses which I have seen described in the American Machinist strike me as being as convenient as "our way." We make a tool with body about $\frac{3}{16}$″ round steel, and a file handle on one end. The other end is bent and ground same as an inside thread tool. To use it insert in the glass tube the desired distance with the right hand, and revolve the tube with the left, pressing on it hard enough to scratch the glass with the point of the tool. If the glass does not break off with the pressure, when a complete revolution has been made, tap it gently near the scratch. Smooth on the grindstone, if necessary. W. C. P.

Warren, O.

## Machinists' Labor in Europe.

From a recent consular report, we learn that the price of labor is much higher in Britain and France than it is in the neighboring countries. In France, for some years, good machine workmen have been paid an average of 12 cts. an hour, and ordinary workmen receive from 7½ to 9 cents. In Germany the machine workmen earn, on an average, for a day's work of ten hours, 75 to 84 cents; assistants, from 50 to 60 cents. For the last few years labor has been at about the same price in France as it is in England. The cost of labor has remained stationary in England, while it has advanced in France 20 to 25 per cent. within a period of ten to fifteen years. In Belgium the cost of labor is be-

tween that of France and Germany. The report indicates that the operation of leveling wages upward is progressing throughout all Europe, the British workman receiving the maximum, to which all others are aspiring.

### Railroad Advisory Boards.

M. H. S. Haines, general manager of the Savannah, Florida and Western Railroad, has recently written an excellent article for the *Railway Review* of Chicago on the advantages of an advisory board to the general manager. As Mr. Haines practices what he preaches, his belief that the management of railroads can derive substantial benefit from an advisory board, is entitled to the highest consideration from railroad officers. The plan followed by Mr. Haines is to advise with the officers of the road on all questions of traffic management, his theory being that in a multitude of counselors there is wisdom. It is certainly rational to suppose that a road master is well able to advise on matters relating to the structure, and the master mechanic on machinery matters; but the trouble with many railroad managers is that they consider themselves above the advice of subordinates, although their own experience may be mostly confined to financial affairs. If the article will persuade a few more railroad managers to follow Mr. Haines' example, the financial condition of the railroads would feel the improvement.

The "Mechanical Theory of Heat," as is now well understood, existed, as a speculation, from the days of the earliest philosophers. The contest which raged with such intensity, and sometimes acrimony, among speculative men of science, during the last century, was merely a repetition of struggles of which we find evidences, at intervals, throughout the whole period of recorded history. The closing period of this, which proved to be an important revolution in science, marked the beginning of the nineteenth century. It was inaugurated by the introduction of experimental investigation directed toward the crucial point of the question at issue. It terminated, about the middle of the century, with the acceptance of the general results of such experiments by every scientific man of acknowledged standing, on either side the Atlantic. The doctrine that heat was material, and its transfer a real movement of substance from the source to the receiver of heat, was thus finally completely superseded by the theory, now become an ascertained truth, that heat is a form of energy, and its transformation a change in the location and method of molecular vibration.

The science of thermodynamics has for its essential basis the established fact of the dynamical nature of heat, and the fact of the quantivalence of two forms of energy—heat and mechanical motion, molecular energy and mass energy. Resting, as it does, on fundamental, experimentally determined, principles, it could have no existence until, during the early part of the present century, these phenomena and these truths were well investigated and firmly established. Immediately upon the settlement of the controversy relating to the nature of heat, it became possible to commence the construction of the science which, asserting the mechanical theory of heat as its fundamental fact, and the conservation and quantivalence of the two forms of energy as its fundamental principle, led to the determination of the method and extent of the transformation of the one into the other, during any prescribed series of physical changes.—*Prof. Thurston at British Association.*

An æronaut who lately performed some balloon experiments in France is spoken of by *Les-Mondes* as "M. Gover, an American engineer, well known by his invention of a telephone, from which he realized a great fortune." Some American engineers appear to be much more famous in Paris than they are in New York.

### Red Tape.

One wheel and eight or ten feet of the shaft of the steamer Stamford lie on the bottom of the ship channel in Boston Harbor, and form a serious obstacle to navigation. At any hour it may cause the wreck of another vessel. Yet it seems to be true that such an obstruction can only be removed by the United States upon an order of the Secretary of War, after a notice of not less than 30 days, and by the State authorities only after the steamer's representative has notified the Harbor Master, and he has informed the Commissioners of Wrecks and Shipwrecked Goods, and they in turn have laid the facts before the Board of Harbor and Land Commissioners, who must assume the responsibility of ordering the removal of the obstruction.—*Boston Congregationalist.*

### Expiring Metal Drill Patents.

By F. R. Brock, Washington, D. C.

A description, with illustrations, of a few representative patents on metal drills, the terms for which have, or are nearly expired, it is thought will be of interest to the readers of the American Machinist, especially as they are at liberty to freely use and make such drills upon the expiration of the patents.

By the ordinary method of preparing the tube sheets of steam boilers for the reception of the tubes (after the sheets are laid out with lines that intersect at the points corresponding with the intended centers of the tubes), the centers are first marked with a punch; small holes are then drilled through the plate, and the plate is finally bored to the size required with a pin or teat drill. The first small holes are required for the steadiment of the pin drill in the making of the larger holes for the tubes.

Theodore L. Webster devised the drill or tube-sheet cutter, shown in the drawing, so as to dispense with that portion of the labor required for the drilling of the preliminary small holes, as described above. His patent expired October 16, 1883.

When the center of the Webster cutter is placed in a center punch marking, the drill may be fed down to the plate and passed through it, while the center remains in the marking and holds the center securely, the spring yielding gradually as the feeding progresses.

The socket *a* carries a circular cutter *b*, which is secured to the lock-pin *c*. This lock corresponds with the direction of the cutting edges of the cutter, so that it remains fastened when the drill is being used or being withdrawn, and may be readily unfastened by simply turning it back when it is required to remove the cutter. When the tool is pressed toward a sheet to be drilled the spring yields, and the center *d* remains in the center punch marking, while the cutter advances and passes through the sheet.

By this means a circular disk is at once cut from the sheet instead of first drilling a small hole and then cutting away the rest of the metal with a pin drill.

This patent, during its life, controlled the manufacture of a circular cutter having a yielding center.

Mr. William H. Henshall devised a tool which works upon the same principle as that of Webster. As it is, however, structurally different from the Webster drill, it is deemed to be possessed of interest to the reader. The Henshall patent expired during the present summer.

In this device also it is not necessary that a hole should be previously made in the sheet, as with the ordinary cutters. It is simply necessary to lay off the centers of the holes, which are afterwards center punch marked, and adjust the ring *F* (see the figures), at a distance above the teeth of the cutters about equal to the distance of the sheet. The spindle *A* is inserted into the spindle of a drill press, and the tube sheet

*Fig. 3*

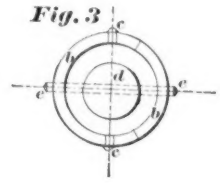


*Fig. 1*

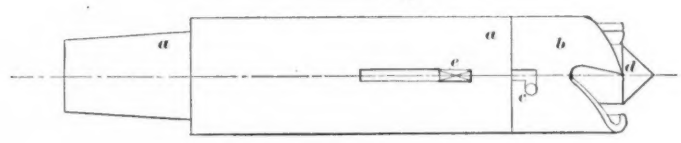
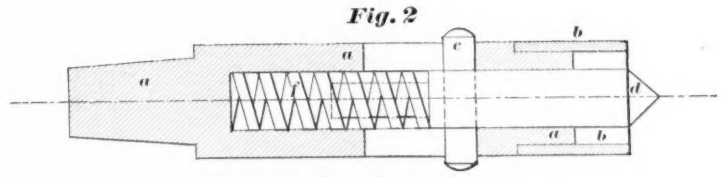


*Fig. 2*



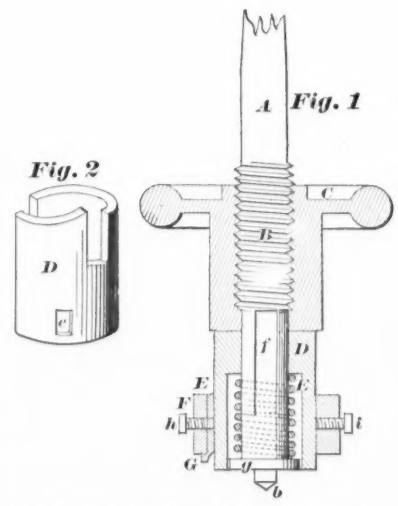
Webster's Tube-Sheet Cutter.

fixed on the drill table, and adjusted so that either of the center punch marks may be directly under the center *b*. On starting the drill the operator holds the feed-wheel *C* from turning. The screw *B* being left-handed, causes it to screw down, forcing the teeth of the cutter *D* into the work. As the cutter revolves and feeds it compresses the spring *E* until it has cut a channel or ring through the plate, removing a circular piece or washer, which sticks to it. The feed-wheel *C* is then reversed, removing its pressure from the cutter, at which instant the spring *E* opens and lifts the cutter from the sheet and forces the washer from it. The tool *G* can be made to countersink the sheet at the same operation, if it is to be on the side drilled from.

An adjusting ring *F*, is slipped over the cutter *D*, and is held in place by set screws *h*, *i*, one of which holds in place the countersink tool *G*, which is contained in an opening formed in the ring, by pressing it firmly

*Fig. 1*

*Fig. 2*



Henshall's Tube-Sheet Cutter.

against the surface of the cutter, its inner surface being rounded to correspond with that of the cutter.

The cadets who practice gunnery on the United States steamer Standish receive a slight taste of war in the peaceful Chesapeake Bay. Twice, within a short period, converted steel-lined breech-loading guns of the Parrott type have burst while being fired, with destructive results. In the latest case the gun burst with a tremendous crash, tearing a great part of the ship timbers into shivers. Pieces of the gun flew completely over the ship, one fragment weighing over five hundred pounds bounding from one side of the ship to the other, making two large holes in the deck in its course. Other pieces almost as large tore around, doing serious damage, but fortunately without finding human targets. It is high time that the Parrott converted guns were subjected to proper inspection, for the next one that bursts may destroy the whole United States navy.

### Safety Car Couplers.

The Railroad Commissioners of Massachusetts have undertaken the herculean task of deciding the proper kind of safety car coupler to be used on the railroads in the State, and they are now engaged examining the merits of the numerous car couplers that are offered to meet the requirements of the Massachusetts law calling for safety couplers. About 180 different forms of couplers compete for the prize, and it is an intensely difficult matter to decide upon what device is best and most practical among several that possess about the same degree of merit. But it is to be hoped, in the interests of suffering humanity, that the commissioners will put the weight of their influence in favor of some good coupler, which will prevent brakemen from going between cars. The decision in a matter of this kind ought to have been arrived at by the railroad companies themselves; and had the Master Car Builders, Association come out squarely in favor of a particular coupler, their action would have exerted great influence towards inducing railroad companies to agree upon what was needed. But in this matter there was hopeless diversity of opinion among the car builders, and the decision has been delayed so often that it was high time for the State legislatures to step in and end the indecision of the railroad companies and of their representatives. Whatever car coupler may be decided upon, there is certain to be much adverse criticism, for heavy pecuniary interests are involved; but time and practical advantages will overcome first objections.

### Starting Up a Big Engine.

Railroad communication is having the effect of stimulating business throughout Mexico, but the pulse of the mining regions seems to receive the greatest acceleration. Regions containing good paying ores, that have slept for years, are wakening up now since the means of transportation are opened up. At Real del Monte, in the State of Hidalgo, a notable and characteristic event lately took place. Fifty years ago a huge engine was placed in position for pumping and operating a rich mine. Although the ore brought up was unusually rich, the expense of transporting ore and fuel proved so great that the mine could not be worked at a profit, and it has been closed for eight years past, and the great engine has been idle. This engine is a noteworthy machine. The cylinder is seventy-five inches diameter, and has a stroke of eleven feet. Owing to the improved condition of the surroundings, brought about by the railroad, the owners of this mine lately felt encouraged to recommence work, and the engine was started up amidst public rejoicings. Bands of music discoursed their strains to the assembled multitude, fireworks were displayed in the evening, and the gala day concluded with the grandest ball ever held in the vicinity. Its long rest did not seem to paralyze the engine, for it started up at the rate of eleven strokes a minute, forcing up a huge flood of water from the drowned mines. We think there would be a good market for economical pumping machinery in these regions, where fuel is very expensive.

The struggle which the Western Union Telegraph Company carried on last year against its striking operators cost the corporation about a million dollars, but that outlay seems to have been little felt on the company's finances, for a dividend of seven per cent. has just been declared on its enormously watered stock. The company has demonstrated that its power over employes is potent as the tyranny of any mediæval baron over retainers; and the question now is, how long can the financial policy of the company tyrannize over the American public?

## The Metric System.

Mr. Coleman Sellers has written a long letter from Germany, where he has been traveling, to the Philadelphia *Ledger* on the metric system. Referring to an article recently published, which says that the people using the metric system are vastly more numerous than those not using it, Mr. Sellers says:

I notice among those countries where this system is said to be in compulsory use, Norway, Sweden, and Denmark. Now, I have just visited these three Kingdoms, and while there I made it my business, as I have done in other countries, to make a full inquiry into the practical operation of the French metric system. I find that the Governments of the three countries above mentioned have adopted the system, and have appointed a date a few years in the future when its use will be obligatory, but as yet it is not in general use, except among the employes of the Government or in the Government depots. The people at large know little or nothing about the subject, and small progress has been made towards preparing them for the change. In the railroad stations may be seen charts hanging on the walls that give the system in a graphical way, and the weight of the luggage upon which an extra charge is made is computed in kilos, not in pounds; while everything weighed in the shops or markets is reckoned in pounds or measured by a "yard-stick," which is twenty-five of our inches in length; this I give from actual measurement—although the shopkeepers say that the Swedish measure for cloth is two-thirds of the English yard. In Denmark so little is known about the enforced adoption of the French system that an important shopkeeper told me that it was never to be adopted.

What I wish to make clear is that the mere fact that the inhabitants of the countries using the metric system are more numerous than those of the countries which do not use it does not furnish so strong an argument in favor of the enforced adoption of this system as would at first appear. The interests involved and the industries which would be affected by the change must be considered. The uprooting of any established system of weights and measures is a matter of very serious import, aside from any question of the relative merits or demerits of the adopted or abandoned systems, and this is especially true of manufacturing countries where vast and varied processes depend upon established standards. It is not an exaggeration to assert that the confusion and loss caused by a change in the system of measurement in Russia, with her millions of peasantry, would be less than that sustained in the city of Philadelphia alone from a like cause. England and America combined control the majority of the commerce of the world. England and America combined lead the engineering output of the world.

To the merchant who buys and sells, it makes no matter if the yard is one of 25, or 36 or 39.39 inches long, nor if the pound weighs more or less than a pint of water; but to the engineer the matter is of more vital importance.

I have gone this summer through the workshops of almost all the great countries on this side of the water and in those of Germany. I have seen the practical use of the system that I have for so long a time condemned. I frequently asked engineers if they like the system and if they use it, and I will give the answer of one in Berlin: "We use it because we have to, and it is better to have some uniform system than the many measurements that formerly prevailed in the German States. The unit of the machine shop is the millimeter in everything except bolts, nuts and screws. All bolts and nuts are made to the English inch, because we use the Whitworth system. We do not like the metric system because it has too small a unit and the meter is too large, and involves the use of decimals."

In Philadelphia the firm of William Sellers & Co. adopted the French metric system in an important part of their works as long ago as thirty years, and have continued its use since, until their workmen are as familiar with it as with the inch. With all this long practice during my connection with the firm, I have written and spoken against the enforced adoption of the system not only because of the expense involved in changing, but because it is not a practical system; it permits of no elastic gradation of shop or trade sizes. The millimeter is taken as the standard to avoid the complication of the constant use of decimals, as nearly all measurements in machine work are less than one meter. This small measure involves many figures, and does not permit any good memorizable series. The inch cut up into the natural division by constantly halving permits the use of sizes best suited to the needs of the workmen.

The standard of the French system is a certain bar, kept for comparison; so is the English yard, from which we get our feet and inches. The high-flown notion that the meter is a measurable portion of the quadrant of the earth's circumference has been given up long ago, and the measurements of England and America are on a better basis of accuracy to-day than those of any other country. The French system theoretically predicates its weights on the weight of a cubic decimeter of distilled water at a temperature of 39.1 deg. Fahr., the weight of which is called the kilogramme, and is two and two-tenths of our pounds; but really the standard unit of weight is the platinum kilogramme weight deposited in Paris.

In Germany you never hear of the kilo, but they sell by the pound, their pound being the half of one kilo; this they cut up as they please into smaller weights, and you can buy half a pound of grapes or butter just as well as you can in America. It is claimed that, given the meter, all weights, etc., can be deduced from it; in theory this is very well. The most skilled workmen, however, are not yet able to make two liters of water weigh alike to the utmost point of accuracy, and the cubical liter is not used, but is converted into a circular or cylindrical vessel, with all the trouble of the problem of squaring the circle.

If a bar of ordinary forged iron be planed up to measure one inch square, and the bar be one English yard long, it will weigh ten pounds, and the tenth of such a bar will weigh one pound more accurately than will the ordinary liter of water weigh one kilo. The English engineer in these days of iron knows when he uses shapes of iron rolled of uniform section that the tenth of their weight in pounds per yard gives him the area of the section, and this one admirable incident will long fix the desirability of the present unit of England and America.

When we consider the interest involved, it will be seen that the population now making practical use of the English standard is greatly in excess of that using, by force, the French system. Millions of those numbered among the people who use the French system have no occasion to use any or know any system whatever save in the crudest form.

Swedish iron and steel are rolled to English inches in size; so, also, their boards are cut to the English inch, because their market is largely in those countries that use the inch. In the Russian machine shops the English inch is used exclusively, and, as I have said, throughout all Germany it holds for all screw sizes. In France and in Belgium the yard stick is the meter hung from a rod like the cross bracket of a drop gas light, placed about 18 inches above the counter. In Germany the half meter, or 20 inches, about, is the measure used, and that held in the hand of a salesman by a handle at one end of the measuring stick. The Swedish machinist carries in his pocket a rule on which he has the English inch, and by its side the French measures; on the other side he has the two Swedish feet—one long in use, and one ordered to be used, but never put into practice. The Swedish roads are laid out now in kilometers, and marked by iron plates, giving at each ten kilometers the distance from some place, while half-way between is a sign 5 kl. This division of the roadway seems to them to be fine enough, as the old Swedish mile was six and two-thirds of our mile, and five kilometers is a less distance.

Carefully as I have considered this subject of weights and measures during the time I have been from home, I am the more confirmed in my opposition to the enforced adoption of the metric system of France in my own country, and firmly believe that those countries that have adopted it are at a disadvantage as compared to even the most imperfect of our systems. America has entered on the line of simplification of its metrology, and that is the direction that should be followed, not by any means giving up what is good, but by making what has been found to be practical better and simpler.

One has not to be long in England to find out how firmly are the seemingly complicated systems of weights and measures of that country fixed with the people. They weigh by the stone and compute by the sterling currency as rapidly or more so than we do with our dollars and cents, and that because their unit is larger. The English shopkeeper knows nothing about decimals, and says, if you ask him, that he has never learned what they are.

England has lately made legal the admirable standard manufactured by Sir Joseph Whitworth, and the chance of her adopting the metric system is not in the most remote degree possible.

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Illustrating the advantages of high-speed engines, Mr. Hoadley, in his paper on "Steam Engine Practice," says: "At the Cambria Iron Works, Johnstown, Pa., a Porter-Allen engine 40x48 inches, several years ago replaced a throttling slide-valve engine, running 82 revolutions per minute with empty rolls, and falling to 65 or 60 at every pass, so that by the time a rail was finished its temperature was very sensibly reduced, and its plasticity greatly lessened. The Porter-Allen engine, running at the unalterable speed of 90 revolutions per minute, finished a rail with eleven passes, instead of fifteen, without sensible diminution of temperature; and fully doubled the production with greatly reduced breakage, and a smaller proportion of defective rails. Of course there were other incidental advantages.

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## Examination for Locomotive Engineers.

The following is the form of questions put to firemen on one of the most prominent railroads in this country before they are admitted as competent for promotion, and the kind of answers expected from those who are considered able for the higher position. The form questions are not adhered to strictly, and care is taken that a candidate for promotion does not commit the answers to memory without properly understanding the subject. No fireman is promoted who does not satisfy the examiner that he understands the practical questions asked.

*Q.*—What are the duties of an engineer before attaching his engine to train?

*A.*—To examine the engine carefully, to see that all set-screws are in place, and rod-keys secure; that the engine is equipped with all necessary signals, firing and hand-tools; the necessary supply of water, fuel and stores. Also to take a look at the flues and crown sheet.

*Q.*—What is important in carrying water in the boiler as to height and regularity?

*A.*—To carry water and steam in the top gauge cocks when working steam, and as uniformly as possible.

*Q.*—What is important in carrying water on grades, and approaching a summit?

*A.*—To carry the water sufficiently high to be sure that the front ends of the tubes are not exposed, and in pitching over a summit to have sufficient water to cover and protect the crown sheet, after finding its level from the front or low end of the boiler.

*Q.*—Should it be necessary, after pitching over a summit, to pump up a gauge or more of water; what should be the condition of the fire?

*A.*—The fire should be kept bright, and burning freely.

*Q.*—Why is this important?

*A.*—To prevent chilling the flues, causing them to leak.

*Q.*—Should you have ample water after pitching over, what should be the condition of the fire?

*A.*—It should be leveled and settled down, and covered over sufficiently to prevent unnecessary waste of steam or fuel.

*Q.*—Should the pump or injectors fail on the road, what would you do?

*A.*—First, smother down the fire, stop promptly, take off the hose and raise the tank valves to ascertain that they are connected; also see that the strainers are clear. If all is found clear, then try the injectors again, and, if the engine has a pump, take it down and see that the valves are free, and would also run water through the feed pipes. When all is open and free put them up and try them again.

*Q.*—Should the water in the boiler get too low to allow you time for the examination, what would you do?

*A.*—Draw the fire and send a messenger to the nearest telegraph office for assistance.

*Q.*—Should the water in the boiler become disturbed and foam, what would you do? And how would you ascertain whether it was foaming, or being over pumped?

*A.*—As soon as the water is discovered discharging from the stack, would at once shut off, and ascertain the height of the water solid. Should the water drop below the second or third gauge, would conclude there was foaming, and would again gently open the throttle. Should the water again rise and discharge from the stack, would put on both injectors, open the surface blow and run carefully; allowing the bad water to be worked off through the surface blow, being very careful not to work the water in sufficient quantities through the cylinders as to endanger knocking out the heads; and would occasionally shut off to see that the water was not being thrown off faster than the pumps or injectors were supplying it. By this means the bad water would, in most cases, be worked out, and with gentle usage would again settle.

*Q.*—Should the blow-off cock be blown out, or be broken off, or a hole be broken in the boiler in any way, what would you do?

*A.*—Draw the fire promptly, and send a messenger to the nearest telegraph office for assistance. Would then disconnect, and get engine ready to be towed in when assistance arrived.

*Q.*—What portions of the engine would you disconnect in such a case?

*A.*—Take off main rods and valve rods.

*Q.*—What is important to observe in setting up or adjusting wedges?

*A.*—To have them so neatly adjusted that there will be no thump of the boxes, and at the same time not so tight as to cramp and not allow them full and free play in the pedestals.

*Q.*—How would you go about setting them up?

*A.*—Would place the engine at half stroke on the right side, block the left wheels, admit a little steam and thump the boxes hard away from the wedges. Would then get under and put the wedges up solid with a short wrench, and make a side mark on the pedestals at top of wedge; then draw them down equally a scant $\frac{1}{8}$ of an inch. Go over the left side in the same manner.

*Q.*—How would you key up, or adjust, the side rods of a ten-wheel engine?

*A.*—Would place the engine on a level and straight track, and on a dead center. Then slack off all keys on that line of rods, would then key the knuckle on center brass first, leaving it sufficiently free on the pin to be moved laterally by hand. Then adjust the front and back ends in the same manner.

*Q.*—Why should you place the engine on exact dead center, and begin by keying the center brass first?

*A.*—In order to insure keying the rods of proper length, to allow them to pass the dead or rigid points without strain.

*Q.*—Can the side rods be keyed too long or too short when not standing on dead center?

*A.*—They can.

*Q.*—If too long or too short, at what point of the stroke will the strain be?

*A.*—While passing the dead or rigid points.

*Q.*—Should you slip the right back-motion eccentric on the road, how would you reset it?

*A.*—Would place the engine on exact dead center on right side, place the reverse lever in full forward gear, and make a mark on the valve rod at the stuffing-box gland; then place the reverse lever in full back gear, and turn the slipped eccentric until the mark on valve rod came to its original position, being careful to see that the fall or throw of the eccentric was in position nearly opposite the forward eccentric; then secure it there.

*Q.*—In what way does the mark you made on the valve rod, while in forward gear, aid you in setting the slipped eccentric?

*A.*—The forward motion eccentric, being in proper position by placing the reverse lever in full forward gear, the valve is brought into proper position on the ports, and the mark gives the position of the valve when the back-motion eccentric is in its proper position, thus setting the slipped eccentric by the good one.

*Q.*—Should a valve yoke break, how would you test in order to determine which side was disabled?

*A.*—Would first place the engine at half stroke on right side, and admit a little steam to the cylinders; then move the reverse lever from back to forward motion, and, if the steam could be shifted from the back to the forward cylinder cock, would conclude that the right yoke was good, and would test the left side in the same way.

*Q.*—Why would you place your engine at half stroke on the side you wished to test?

*A.*—In order to get the full movement of the valve over the ports on that side.

*Q.*—After locating the broken yoke, how would you disconnect?

*A.*—Would take off the steam-chest lid, place the valve over the ports, and block it there securely; replace the lid, take off the valve rod, take off the main rod, block the cross-head, and proceed with half train, if freight; if passenger, would take the full train to the next telegraph office, report and give judgment as to whether the engine would take entire train to its destination.

*Q.*—Should you blow or break out a cylinder head, how would you disconnect?

*A.*—First take off the valve rod and close the ports with the valve, and secure it by cramping with the stuffing-box gland; take off main rod and block the cross-head.

*Q.*—Should the cylinder packing drop and blow badly on the road, how would you determine which side was down?

*A.*—In starting from a station would notice the right cross-head, and, if the blow occurred when it was leaving each extreme end of the stroke, would locate the blow in the right cylinder.

*Q.*—Should it blow so badly as to make it necessary to set it out on the road, what would be important for you to observe in setting it out?

*A.*—Would be careful to set the piston central in the cylinder, using calipers if at hand, and, if not, would use a stick of proper length, and be careful only to set the packing to fill the cylinder neatly, using as little power on the bolts as practicable, lock the nuts securely and replace the follower, being careful to screw the follower bolts home solid.

*Q.*—Should you be running an engine which had but one pump, it being on the right side, and that side became disabled, so that it would be necessary to disconnect it, the injector be too small or fail to supply the boiler, what would you do to avoid drawing the fire and being hauled home?

*A.*—Would disconnect the piston from the cross-head on the disabled side, and take it out, put up the main rod and work the cross-head, which would give the use of the pump.

*Q.*—Should you break the top rocker-arm, how would you disconnect?

*A.*—Take off the valve rod and broken arm, close the ports and secure the valve with the stuffing-box gland, and disconnect, as in case of broken cylinder head.

*Q.*—Should the bottom rocker-arm break, how would you disconnect?

*A.*—As a rule would not take off eccentric straps, but with an engine badly worn and loose in link-hanger, so that the link could play about freely when running, would take off the eccentric straps and disconnect, as in case of broken cylinder head.

*Q.*—Should you break a link-hanger, how would you disconnect?

*A.*—If but a short distance to run, and no stopping or shifting to do, would run in without disconnecting, after cautioning the crew to keep the train under good control and stop promptly when signaled to do so. But if a long distance to run, would disconnect as in case of broken cylinder head.

*Q.*—In what way would you have lost control of your engine with broken link hanger?

*A.*—Would only be able to reverse one side of the engine.

*Q.*—Should you break an eccentric strap, how would you disconnect?

*A.*—Take off both eccentric straps on that side, and disconnect as in case of broken cylinder head.

*Q.*—Should you break the back section of a side rod on a six-wheel connected engine, what would you do?

*A.*—Would take off both back sections, and run in with main and forward wheels connected, with about two-thirds of train.

*Q.*—Should you break a forward section, how would you disconnect?

*A.*—Would take off all side rods and run in without train.

*Q.*—Should you break a main crank-pin close up to the wheel, how would you disconnect?

*A.*—Would take off all side rods and the main rod on disabled side, and run in without train.

*Q.*—Should you be running an engine which had a slide throttle valve, and it would strip or disconnect inside the boiler partly open, how would you manage?

*A.*—Would reduce the steam pressure within easy control, and state the trouble to the crew and caution them to act promptly when called upon to do so. Would work the train, if freight, to the nearest siding, and back it off; if passenger, would keep the pressure within easy handling, and work the train to the nearest telegraph office, report, and ask for orders.

*Q.*—Should one of the forward tires on a ten-wheel engine break, how would you manage?

*A.*—Would jack the wheel up the thickness of the tire, take out the oil cellar, and cut a block to fit the bottom of the box and journal sufficiently thick to hold the axle up in its place when resting on the pedestal brace; would then run in without disconnecting, provided the rod had not been bent or damaged by the broken tire. Would take in full train.

*Q.*—Should you break a main tire, how would you manage?

*A.*—Would first send messenger to nearest telegraph office and ask for assistance. Would then block up the axle and wheel the thickness of the tire, slack off the side-rod keys, and run in carefully without train.

*Q.*—Should the back tire break, how would you manage?

*A.*—Would take off the back section of rods, block up the axle, run very carefully, especially around curves, to nearest telegraph office, report, and ask for orders.

## Safety of I Section Side Rods.

Commenting on the letter which we recently published from Mr. Ely, superintendent of motive power of the Pennsylvania Railroad, in which he testifies to the safety of I section side rods, the *Railroad Gazette* says:

"In contrast to this statement, we may mention that the locomotive superintendent of the Great Western Railway (England), lately stated at an inquest on a fatal accident caused by the breakage of a side rod, that on his line sixty-six side rods had been broken in the three years ending June 30, 1884. In only one case did the engine leave the track. The total number of locomotives on the English road is about the same as on the Pennsylvania, but the total number of coupling rods is doubtless less, as single engines are used in place of coupled for the fastest express trains, and six-coupled in place of consolidations for coal and freight trains. The English line should therefore show a smaller number of breakages. The difference appears, therefore, mainly attributable to the use of the I section on the Pennsylvania Railroad, this form being little used in England, though common on the continent of Europe."

## Chinamen Wipers.

At Carlin, Nevada, where Mr. W. F. Smith is master mechanic of the Central Pacific Railroad, most of the laborers he has are Chinamen. He says they make good wipers and soon become handy at doing the work they are kept regularly upon. Like most of their race they are of frugal and saving habits, their chief aim in life being to accumulate enough money to enable them to return to the Flowery Land and spend the evening of their days enjoying the luxuries that the returns from a few hundred dollars can supply. So soon as the happy day arrives when a Chinaman considers himself rich enough to abandon the handling of greasy waste, he applies to the master mechanic for a certificate of character, so that the powers that be in China may see that he has behaved himself in a respectable manner while sojourning in the land of the stranger. This testimonial Mr. Smith addresses to His Serene Highness, the Emperor of China, writes it out in his boldest hand, seals the document with the stamp of his office, and the ex-wiper departs in quiet raptures.

There is some humor in the political press in this campaign. The *Brenham* (Tex.) *Banner* devotes fourteen editorial notices in one issue to a certain candidate. One of these notices reads: "The candidacy of —— is received without comment in most places, and no interest is taken in it."

## Hints for Cleaning Boilers.

FROM "THE LOCOMOTIVE" (HARTFORD BOILER INSURANCE COMPANY).

Following the application of any boiler purger, or other substance for loosening scale or deposit upon the shell, heads or flues of a steam boiler, special care and attention should be given to cleaning out the boiler, with a prompt removal of such loose fragments as may have become detached and fallen down.

These particles, if not removed, are often swept about by the various currents within the boiler, and, collecting in a conglomerate mass upon some part of the fire surface, prevent access of water to that particular part, and thereby it is overheated and is bulged, or bagged, as it is sometimes called, often inflicting a dangerous injury to the boiler, and requiring a considerable outlay for new sheets, a patch, or perhaps other expensive repairs.

In the use of soda and other preparations used for removal of boiler incrustations that are soluble in water, a separate vessel may be provided, suitably connected to the feed pipe, so that the preparation, in its proper proportions, as recommended, may be first dissolved, and, when properly prepared, fed into the boiler. When there is a heater, the solvent may be prepared and emptied into that.

Logwood or oak chips, leather clippings, and many other waste products of a manufacturing ertablishment, that contain some useful ingredient, as tannin, soda, or starch, may often be used advantageously when they are recommended and their use directed by an inspector, otherwise serious difficulties may result—perhaps endanger the safety of the boiler.

We have known silk fabrics and other delicately-fine articles, to be ruined in the dyeing process by the too free use of boiler compounds, of which the users were ignorant in two essential particulars, viz., as to their composition and the safe quantity to be used. The importance of knowing these particulars will be evident when we remember the great tendency of the boiler to foaming when purgers are used, and the increased danger at such times of carrying over some of this water, mingled with steam, to the dye kettles, or wherever it may be used.

We should not have a great deal of sympathy for the man who, declining to avail himself of the services and advice of a physician, ruined himself by dosing with all sorts of nostrums of which he was ignorant, but such a man at the worst can but ruin himself; while another, who persists in dosing his boiler, may not only lose his own life, but he may sacrifice many other lives in the same foolish way.

We know of an instance in which a party who had some condemned bacon in his storehouse, which he thought to use advantageously in cleaning and lubricating his boiler, he having somewhere read that grease was an excellent thing for the purpose. As he described it afterwards, the boiler nearly turned inside out, and he fondly hopes that he may live long enough to get even with the man who recommended it to him. Another case was that of a fireman, whose duty it was, under the direction of the engineer, to fire and keep clean a battery of boilers, who, happening to hear some of his mates say that oil was an excellent thing for softening scale, thought to make a trial of it on his own account. So, one Sunday, when cleaning out his boiler, he went through the shops connected with the establishment and gathered up the refuse oil and grease from various drip-pans, securing in this way two or three gallons, which he poured into one of the boilers, and afterwards filled it with water. Soon after steam was got up the fire-sheets became bagged and beautifully corrugated, and leaked like a sieve.

In boilers under our supervision we have used crude petroleum a great many times for the purpose of loosening lime scale, and with the most satisfactory results. We don't approve of the use of grease, and we deem the application of animal oils or fat to the interior of a boiler for that purpose as very hazardous.

As a rule, when a boiler is in service, a systematic daily charge of a proper solvent, graduated to the capacity of the boiler, will be found more efficacious than a larger charge at longer intervals, and it is less likely to cause foaming and kindred difficulties. An important matter sometimes overlooked is the need of regular times for cleaning, and the preparation which should be made for it.

When about to put a boiler out of service for a thorough cleaning, it will be found an excellent plan to let the boiler cool off gradually, and the pressure fall slowly until it has reached about five pounds, when the safety valve may be raised and the remainder blown off.

Run off the water and remove the hand-hole plates, when the scale will be found much softened and easily detached, while the deposit can readily be washed off with a hose. We have found this an excellent plan to pursue even in marine boilers using sea water, and depositing a very refractory scale, as the waters of the North Atlantic or Gulf of Mexico.

Blowing down a boiler between the limits of high and low water, or, in other words, between the upper and lower gauge cocks, is often very beneficial, and assists materially in freeing it from the ill-effects of scum and other impurities. If, however, this blowing down is not intelligently done, there is a probability of great waste and serious loss; for, in blowing out good water at the temperature of the steam pressure, and replacing it by other water, perhaps of no better quality, at the much lower temperature of the feed, there is a great loss of heat, and consequent waste of fuel.

Blowing down a boiler can, however, under no circumstances, be depended upon to thoroughly clean it, and remove loose fragments of scale and much of the deposit commonly found. This can only be done by systematic, periodical washing out, at intervals to be determined by the circumstances of the case.

One of the most interesting exhibits in the Philadelphia Electrical Exhibition is that sent from the Government ordnance departments. The exhibit is tastefully enclosed in a fence formed from an anchor cable, and the display is well arranged for inspection.

The articles that attract most attention here are the naval searchlights, two large lanterns that look like overgrown headlights. Illuminating power is supplied by two Gramme dynamos, driven by a Brotherhood three-cylinder engine connected direct to the armature. A torpedo boat of the Lay-Haight type excites much curiosity, but nothing can be seen beyond its cigar-like outside, with a small screw propeller in the stern. This article of naval warfare can be controlled from a vessel and sent on its voyage of destruction. A vessel of highly compressed carbonic acid gas contains the means of working an engine which operates the screw. The bow of the boat is charged with 400 pounds of gun cotton. The numerous ingeniously devised electrical appliances in this exhibit devoted to facilitating destructive effects in naval warfare, indicate that this country is keeping up with other nations in invention, even if the list of our fighting vessels is short.

We believe this Exhibition has done a good educational work among the rising generation of Philadelphia, for the children attend in large numbers, and the older pupils appear to take an intelligent interest in the exhibits. This appears to be particularly the case among girls, many of whom are to be seen daily, note-book in hand, writing particulars of what they see. An intelligent study of the machinery and apparatus is materially aided by a series of electrical "primers," got out in a clear, simple style, and sold in the building for a few cents.

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☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, OCTOBER 25, 1884.

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## The World's Fair of 1884.

Applications for space to exhibit at the World's Fair in New Orleans are being received in large numbers. Some manufacturers desire to make very extensive exhibits. Machinery manufacturers in the West seem to be availing themselves of the privilege to secure space more than those in the East. Why this is so we cannot say. At the rate applications for space are now coming in all the available room is likely to be apportioned before some who expect to exhibit make up their minds to apply. As the exhibition opens December 1, those who care to be represented cannot make arrangements any too soon.

One of the largest and most interesting displays of machinery ever made in this country is promised. The machinery department is 1378 feet long and 300 feet wide in the main building, which takes one-third of its whole area. Besides this space an addition has been erected 350 feet long, and 150 feet wide for heavy machinery. Galleries are so arranged that visitors can overlook more than two miles of shafting driving machinery of almost every variety employed in industrial pursuits. Besides the main building and the machinery annex an immense building is to be devoted to United States and State exhibits. Horticultural Hall is 600x200 feet, and the Art Gallery 250x100 feet. The grounds embrace 247 acres, around which will run an electric railway. That the number of visitors to this great exhibition will be very large, no one can doubt. The mild climate of New Orleans in the winter will induce tens of thousands in the North to visit the Fair for pleasure as well as for information.

## An Efficient Labor Commissioner Wanted.

State Labor Commissioner McGrath has returned from the Upper Peninsula of Michigan, where he had been on business connected with the Labor Bureau. He reports that the average wages paid in the mines in the copper district are: Machinists, $56 per month; engineers, $48; firemen, $45; carpenters, $55; blacksmiths, $64; masons, $48; teamsters, $42, and watchmen $50. Laborers averaged $33 per month. The men have work all the year and rents are low, though the cost of living in other respects is higher than in the Lower Peninsula. —*Grand Rapids Morning Telegram.*

A year ago last spring a labor bureau was established in the State of New York, and Charles F. Peck appointed by the Governor as Commissioner to conduct the work of that bureau. The bureau thus far has been a fizzle. No practical results in the way of collecting industrial statistics like those in item above quoted have been achieved. Either the Commissioner is incompetent, or he is too much pre-occupied by political work to give attention to the work for which he is paid by the State. We have never heard of any other commissioner of a labor bureau giving time to active political work. The Empire State, which has the most material of any State in the Union for a labor bureau to work upon, is far behind Michigan, Massachusetts, Pennsylvania, Ohio, Missouri, and all other large manufacturing States in collecting and disseminating desirable statistics of labor. Those States have efficient commissioners of labor statistics. It is mainly owing to the practical work of Carroll D. Wright, Chief of the Massachusetts Bureau, that necessary labor legislation in that State is ten years in advance of the State of New York. Upon the correct information furnished by the Pennsylvania bureau, the truck pay system was abolished by law, and wages in that State must be paid in cash. In this State the truck pay system still flourishes. One skinflint mining company that employs some thousands of hands requires its workmen to take 80 cents of every dollar of wages in "store pay" and rent of log cabins, then charges much more for the goods than they are worth. As many of the men get but 80 or 90 cents a day their condition may be imagined. That company owns a railroad 34 miles long, at one extremity of which are the mines. Before they introduced the store pay system they paid their workmen in checks, requiring every check to be presented to be cashed at the bank by the person to whom it was drawn. This necessitated a journey over the road its whole length, involving the loss of a day's time and the expenditure of $5 *for a ticket* to go and return over 34 miles of railroad. We mention this example to show the need of collecting and reporting facts regarding labor in order that evils may be corrected. The people of this State want an efficient Commissioner of Labor Statistics, and the incubus now in that office should either retire or be removed.

We hereby extend our thanks to the Kings County Mechanical Association of Practical Machinists and Engineers for the compliment of electing the editor of the AMERICAN MACHINIST an honorary member of that society at its first meeting. The association meets every Tuesday evening at Heiser's Assembly Rooms, 136 Broadway, Brooklyn, N. Y.

## An International Inventors' Exhibition.

An International Inventors' Exhibition will be held in London in 1885, under royal auspices. The exhibition will be divided into two sections, the first being devoted to inventions, processes, and products brought into use since 1862; the second, to musical instruments constructed or in use since 1800. Exhibitors are required to show that their proposed exhibits come within the terms above mentioned. The exhibition is intended to illustrate the industrial progress of a quarter of a century. Only a limited space can be given to each article, and it is desired to illustrate with the apparatus by which a process is carried on a limited number of industrial processes in their consecutive stages. When the invention relates only to parts of a machine, the whole machine will not be admitted unless the improvement cannot be sufficiently well shown without exhibiting the entire apparatus, or unless the exhibit is of surpassing interest.

As the exhibition will be limited to the illustration of industrial processes, examples of either the raw material employed, or the finished product, will only be admitted when they are required for the full demonstration of a particular process. It is not proposed to allot space for the exhibition of manufactured goods alone, unaccompanied by any illustrations of the process of manufacture.

The scope of the exhibition is quite large, about every branch of mechanics being included.

It is believed that many American manufacturers will find it desirable to send exhibits, and in order that they may be provided with proper facilities to avail themselves of the full advantages of the exhibition, our government should certainly make as large an appropriation as was made for the International Fisheries Exhibition. When Congress meets, some member who is anxious to secure the gratitude of the manufacturing interests of the country should move for such an appropriation and the appointment of a commissioner to carry out the plans to assist American exhibitors.

In New Jersey, as in some other States, there is a law providing that children under a certain age shall not be employed in factories unless they attend school a specified part of the year. To comply with the provisions of this law, the Lorillards, who employ a large number of children in their tobacco factory in Jersey City, have opened a night school, hiring competent teachers and paying all expenses themselves. This action on their part is commendable under the circumstances, but there is something wrong in the circumstances that compels children not more than twelve years old to work ten hours a day in close rooms and amidst dust and dirt, and then be shut up two hours more in a school-room. The best civilization cannot be expected through such conditions, and no one, unless compelled by the hardest necessity, would be willing to subject children to this strain. Still, as between this and growing up in ignorance, it has its advantages—such as they are.

In a recent issue, we published a letter from "Miss Frances Cassey," Oberlin, Ohio, about a $4 apparatus for silver and nickel-plating. We have since received information which leads us to believe that the writer of that is a fraud. The letter only asked for some piece of stone or other specimen for a cabinet collection. We advise our readers not to send any money upon representations received from that source.

## Literary Notes.

Vol. V. of the "Transactions of the American Society of Mechanical Engineers" is before us, together with a complete table of contents of the volume and general index of the first five volumes, embracing the work of the Society from its foundation in 1880. Since F. R. Hutton became secretary, Vol. III. was issued in July, 1883; Vol. IV. in January, 1884, and Vol. V. the latter part of September. The index bears evidence of much study and careful preparation.

ELECTRICITY; ITS THEORY, SOURCES AND Application, by John T. Sprague. E. and F. N. Spon, 35 Murray Street, New York.

The author of this book is an original investigator in the field of electrical research. He does not follow the beaten track in his investigations, but strikes into new regions and tells his discoveries without deferring much to the accounts of those who have preceded him. In many respects he is a scientific iconoclast, tearing down the idols raised by previous devotees of electrical inquiry, and he has received a fair share of the idol-breaker's reward of unsparing abuse. The key-note of the book is found in the preface where Mr. Sprague asserts that "there are two electricities known to the scientific world; the electricity which exists in nature; and the electricity which, created by mathematicians, exists chiefly upon the black-boards of the professor's class room. It is the first of these electricities which this work endeavors to elucidate." He then plunges into an investigation of the accepted principles of mechanics, the laws of motion, energy, force and heat and the general principles of chemistry and rattles up the dry bones of scientific dogma in a most uncomfortable manner, but persistently adheres to proved laws in preference to mere hypotheses. He bears particularly hard on the practice of giving a phenomenon a name and then using the name to explain the phenomenon. This practice has been so much followed in elucidating electrical matters that the author of this work seems to be undermining scientific structures when he tells us that we "know absolutely nothing" about forces which every school-boy is ready to explain; yet a little reflection convinces us that popular knowledge did not grasp the principle but merely the name.

The book is very exhaustive and follows electrical manifestations over a wide range. Although making no pretensions at being an elementary treatise it contains the elucidation of elementary principles in a form that will prove of service to the student, and the book as a whole will be a most reliable guide in forming conceptions of the general principles of a science which is daily assuming more importance. The ordinary phenomena of electricity are hard to comprehend, and this is probably the reason why so much unmeaning verbiage has been written about it. Mr. Sprague comes with the determination to tear the veil off hollow pretenses and show the naked truth. Our limited space prevents us from entering into a detailed review of the book. We can only say that it treats the theory of electricity in accordance with the latest investigations of physical science; the ordinary sources of electricity are treated at considerable length; and its varied applications are described in a lucid manner and brought down to the date of publication.

Farley's Reference Directory of the Machinists and Metal Working Trades of the United States for 1884 is one the best works of the kind that we have seen. While such a book as a complete directory of all machine

shops in the United States is not likely to be seen, this comes approximately near the mark. It is arranged by the States and towns and specifies not only the particular business of each establishment, but its commercial rating. The publishers are A. C. Farley & Co., 413 Walnut street, Philadelphia.

## QUESTIONS AND ANSWERS.

*Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.*

*Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.*

(406) **A. D. M., Bridgeport, Conn., asks:** Which side of a leather belt should be run next the pulley? *A.*—The opinion is very general that it is better to run the grain side next the pulley.

(407) **A. J. R., Brooklyn, N. Y., writes:** 1. I have a model steam pump, of my own make, steam cylinder 1″, water cylinder 9-16″, stroke 1½″. The discharge water is not thrown steadily, only at very quick speed. Can you tell me the trouble? *A.*—We could form no opinion, without seeing the pump. 2. What size should the air chamber be, in proportion to the bore of the cylinder of a pump? *A.*—There is no rule for the size of air chamber. Make its capacity not less than five times that of the pump.

(408) **W. H. D., Leominster, Mass., asks:** 1. What is the metal of which the frames of many single-barrel breech-loading guns are made? *A.*—Malleable iron. 2. How is the mottled appearance of gun trimmings produced? *A.*—By case hardening. 3. What is used to brown and to blue gun barrels? *A.*—Nitric acid is sometimes used to blue barrels; blue vitriol, aqua-fortis, and sweet spirits of nitre to brown them. 4. Can cast iron be case hardened, so as to be stronger? *A.*—No. 5. How is wrought iron case hardened? *A.*—See AMERICAN MACHINIST of December 23, 1882.

(409) **W. S., Evansville, Ind., asks:** 1. What can I use for brazing soft brass castings that will melt at a lower temperature than spelter? *A.*—You can make a *solder* for the purpose of two parts tin and one part lead. We do not think you can successfully braze them. 2. Can I construct a small gas motor of one-eighth horse-power; will one work successfully on so small a scale? *A.*—Motors of this size will work successfully. 3. Where can I obtain full description of the various gas motors? *A.*—Nowhere, that we are aware of.

(410) **J. L. L., Monmouth, Ill., asks:** 1. Will low water in a boiler cause an explosion? *A.*—Low water in a boiler may permit some of the sheets to get overheated, and hence weakened so that they will give way. Overheating a portion of the boiler may also cause, by unequal expansion, undue strains on other parts of the boiler, causing rupture there, in either case bringing about what is popularly called an explosion. 2. Will pumping cold water into a hot, empty boiler cause an explosion? *A.*—It is almost sure to cause rupture, in some part of the boiler. 3. Did Mr. Lawson in his experiments try that one, and is his boiler absolutely safe under such conditions? *A.*—We believe none of his experiments were in that direction. No boiler is in any degree safe under such conditions.

(411) **O. M., Sharpsburg, Pa., writes:** 1. We have a belt 150 feet long, 8″ wide, which is stretched out of shape on one side. How can I straighten it? *A.*—If the belt stretches more on one side than on the other from difference in the quality of the leather, it will be a difficult matter to straighten it. You can help it to some extent by cutting the belt in several places and lacing it in such a way as to strain the tight side more. Perhaps arrangement of pulleys tends to strain one side of the belt more than the other. If so, this should be remedied. A temporary remedy will be to turn the belt end for end. 2. We have a belt 120 feet long, 14″ wide, that is so dry it cracks. How can I remedy this? *A.*—The belt needs oil. Apply neats foot oil, or some of the preparations sold for this purpose.

(412) **C. U. S., South Natick, Mass., writes:** 1. We have a 48″ boiler 14 feet long, with 49 tubes, 2¾″ inside diameter. The grate surface, 4 feet by 4 feet, and bridge wall 6″ from shell. The flue leading to chimney is 9″x17″, the chimney is 55 feet high, 20″ square. The draft is sluggish. Can you tell me the trouble? *A.*—The draft would be improved by a higher chimney. The flue leading to chimney is of insufficient area. The area of opening through this flue should be equal to the combined area of openings through tubes, which is nearly 300 square inches. 2. Could I heat a house 225 feet from boiler? The first floor of house is 10 feet higher than bottom of boiler. *A.*—You can heat the house satisfactorily from boiler. 3. Will it be best to return the water from heating pipes in house to boiler? *A.*—We should return the water.

(413) **W. S. R., Dakota, writes:** Please inform me the amount of water used in railroad round-houses per locomotive, for all purposes, washing out, filling boilers; also the amount of water consumed at railroad water tanks and depots. *A.*—It generally requires about two thousand gallons of water to wash out and fill up a locomotive boiler. Boilers are washed out much more frequently where water is bad than where it is good, so that must be considered in calculating the quantity needed for a round-house. From seventy-five to one hundred gallons per mile is the quantity of water used by an ordinary locomotive. The quantity of water required for a station tank will depend upon the number of trains passing.

(414) **W. H. M., Providence, R. I., writes:** In your issue of September 20, there is an article in which the writer attempts to prove that the loss in the use of an engine too large for the work required was due to back pressure on the piston. It is stated that this amounted to 15 lbs. per square inch. I think the cause is cylinder condensation. In my opinion there is no loss due to the atmospheric pressure on the piston. The writer compared a 25-horse power engine working under a load of 25-horse power with an 80-horse power engine working under the same load. The greater amount of steam used in the larger engine, it is claimed, was used in overcoming the back pressure on a piston of greater area. Suppose we have a mean effective pressure of 40 pounds per square inch on a piston. From the amount of work to be obtained from this steam he would take out enough to overcome a back pressure of 15 pounds per square inch, leaving only 25 pounds per square inch for actual work. He is working from mean effective pressure on one side of the piston and from the absolute pressure on the other. My way of reasoning would be, that we would have on one side of the piston a mean absolute pressure of 40 pounds plus 15 pounds, which equals 55 pounds, while on the other side we would have a mean absolute pressure of 15 pounds. In other words, the atmospheric pressure appears on both sides of the piston. We have a mean absolute pressure of 55 pounds, 15 pounds of which cost us no fuel whatever. This 15 pounds will balance the atmospheric pressure on the other side of piston. Therefore the back pressure due to the atmosphere did not cost us anything. Is my reasoning correct? *A.*—Your conclusions are not right. There is no connection with the atmosphere and the *steam* side of the piston after the admission valve opens. All the pressure to move the piston comes from the boiler, and all calculations of pressure must be made from vacuum.

## BUSINESS SPECIALS

*Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.*


Katzenstein metallic packing, 169 Christopher st., N Y

Mackenzie Cupolas and Blowers. 245 Broadway, N. Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Rotary Files, Tower M. Works, E. Brookfield, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

Mech'l drawing and machine designing, work requiring skill and experience solicited. Reasonable rates. Corresp'nce invited. Weston & Smith, Syracuse, N. Y.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N. Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the machinists, iron, steel, and metal-working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

The Complete Practical Machinist, $2.50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Steam users, expecting to put in a first-class engine, from 10 to 60-horse power, will find it to their interest to send to the Straight-Line Engine Company, Syracuse, N. Y., for their new catalogue.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 145 Broadway, N. Y.


## MANUFACTURES.

Ashtabula, O., will start a $100,000 nail mill, to employ one hundred hands.

D. McClure, Natchez, Miss., will erect an extensive foundry and machine shop.

The Novelty Works, destroyed by the great fire in Cleveland, O., are being rebuilt.

J. W. Reedy, elevator manufacturer, Chicago, Ill., is about to erect a new foundry, 100x50.

Charles Zies, 89 and 91 South Fremont street, Baltimore, has just established a machine shop.

The Board of Public Works, Nashville, Tenn., contemplate spending $10,000 for new boilers.

C. O. Wolcott, 55 Pearl street, Brooklyn, N. Y., will erect a factory 69x113 feet, three stories high.

A charter has been granted to the Texas Blacksmith and Wheelwright Association, Fort Worth, Texas.

Work on the new West Shore Railroad shops, at Frankfort, Herkimer county, N. Y., is progressing rapidly.

It is understood that General Butler has disposed of his entire interest (200 shares) in the Middlesex (Mass.) Mills.

T. W. Swimm will erect a two-story shop, 20x45 feet, on Gates avenue, near Nostrand avenue, Brooklyn, N. Y.

We understand that the Otis Brothers' Elevator Works, Yonkers, N. Y., will soon place a new style of gas engine upon the market.

The Williams & Orton, Manufacturing Company, of Sterling, Ill., will shortly put on the market a new gas engine, styled the "Charter."

E. W. Ross & Co., Fulton, N. Y., will move their manufactory of agricultural implements to some locality where the best inducements are offered.

The contract for rebuilding the machine works of the Silver & Deming Company, at Salem, O., has been awarded to Herbert W. McCracken, for $21,000.

The Savannah, Florida, and Western Railroad intend building new machine shops, and the specifications are under consideration of the advisory board of the road.

Mr. J. A. Crouthers, manager for the Baragwanath feed-water heater, reports his people so busy that they are working till ten o'clock every night to keep up the work.

D. Forniraseo, of Belton, Texas, is receiving the machinery for his machine shop. He has expended between $8,000 and $10,000 so far, and will probably build a foundry.

The Chicago Hardware Manufacturing Company are again increasing their capacity by the addition of new machinery. Some novel specialties will soon be brought out.

Dean Brothers, Steam Pump Works, Indianapolis, Ind., have issued a new price-list of duplex steam pumps, as a supplement to their catalogue, which was issued last April.

The "pop" valve patents are again the subject of litigation, the Consolidated Safety Valve Company having brought action for infringement, against the agents of the Orme Safety Valve.

The Lowell Machine Shop has recently received orders from the Sibley Manufacturing Company, of Augusta, Ga., manufacturers of awning stripes, duck, etc., for $100,000 worth of new machinery.

The Anthony & Cushman Tack Company, Taunton, Mass., has incorporated with capital of $75,000. James Y. Anthony is president and treasurer, and David B. Cushman and Francis E. Fuller directors.

The Chicago *Tribune*, in a special article on the business interests of the city, says that sales of stoves and furnaces amount to a larger sum in Chicago than in any other city in the United States.

The Cambria Iron Works, of Johnstown, Pa., recently ordered from Knowlton Manufacturing Company, of Rockford, Ill., a large, slow-raising, quick-striking, helve hammer, for rapid forging, in their Steel Works.

David C. Richards and John B. Guinn have recently started the Enterprise Machine Works, Knoxville, Tenn., for the manufacture of steam engines, circular-saw mills, and all kinds of grist-mill machinery; also shaftings, pulleys, and hangers.

The newly-organized Portsmouth (N. H.) Iron Company has $130,000 capital stock. Frank Jones is president, C. H. Mendrum treasurer, and Nathan Whalley superintendent. They have erected a machine shop 204x72 feet, two stories high, and a foundry 130x46 feet.

Robert Winship, George Winship, Charles R. Winship, R. E. Rushton, C. J. Hancock, and E. H. Schenck have organized, in Atlanta, Ga., the Winship Machine Company, to manufacture machinery. Paid up capital $200,000, with privilege of increasing to $500,000.

The Southern Baxter Electric Light and Power Company has been incorporated in Baltimore, by Dr. Alan P. Smith, B. M. Greene, William Whitridge, and others, to manufacture and sell electric light machinery, etc. Capital $1,000,000.—*Baltimore Manufacturers' Record.*

The stockholders of Harrison Wire Company, of St. Louis, have voted to increase their bonded indebtedness from $150,000 to $250,000. It will, after a while, become necessary to have stock exchanges to market the bonds and other securities of manufacturing corporations.

The Tibbles Manufacturing Company has lately been incorporated for the manufacture of an improved sewing machine. Mr. C. E. Tibbles is president, and J. A. Stafford secretary. Their works are at 13 South Canal street, Chicago, and the company is building new tools, etc.—*Industrial World.*

Thomas H. Dallett & Co., manufacturers of portable drills, also drilling and boring machinery, 21st street, above Market street, Philadelphia, have issued a new illustrated catalogue (pocket size). It has twenty-four pages, and in addition to describing the tools, gives a long list of well-known firms and companies who are users of the tools.

The St. Louis *Age of Steel*, in its notes of the Exhibition in that city, says: The number of ladies who visit the mechanical department is constantly on the increase. At first they claimed to be afraid of the machinery, but everybody knows it was the oil that dripped from the shafting. Now that the oil nuisance has been abated, the ladies fairly swarm around the machinery.

C. M. Lee, of Athol, Mass., has nearly completed another hoe factory, 140 feet long, 45 feet wide, and four stories high. New machinery will go in as soon as possible. Power will be furnished with a 90-horse power engine, whose make is not yet determined. Mr. Lee will employ nearly eight hundred hands when his new factory is completed. He is now running some three hundred and fifty in the old one.

F. H. Clement, Rochester, N. Y., manufacturer of wood-working machinery, writes us: "My trade during the first seven months of this year was considerably larger than at any similar period since I have been in business, and this in the face of acknowledged dull times." He attributes this to furnishing customers more than they expect. A sheet of testimonials, as to the effective value of his machinery, has just been issued.

The Lawrence (Mass.) Machine Shop issues an illustrated catalogue of centrifugal pumping machinery, constructed on the Gwynne system. The proprietors of this establishment are engineers of experience with centrifugal pumps. In their preface, they say: "We have before us catalogues of centrifugal pumps, some of imposing dimensions, in which many pages are devoted to a description of supposed improvements (but which in reality are quite the reverse), in which the most crude and incorrect opinions are put forward with such an air of authority and apparent truth, that persons reading them and not understanding the details are easily misled. As, for instance, that a 6″ pump will deliver 2,600 gallons of water at a height of 40 feet, consuming only 20-horse power. Now, 2,600 gallons of water equals 21,658 lbs.×40 feet raised equals 866,320 foot lbs.; this divided by 33,000 foot lbs. (equivalent for horse-power) equals 26.2-horse power, or with an expenditure of 20-horse power, in force applied, a result of 26.2-horse power in effect is obtained! (?) truly a wonderful result, as all friction is overcome, and they show 131 per cent. of effect. They are probably on the right road to perpetual motion. All other figures in their tables give a like result."

The success of the Babcock & Wilcox water tube boilers, using blast-furnace waste gas as fuel, at the Lucy Furnaces, Pittsburgh, Pa., is leading to other trade in this direction. Sales have recently been made to blast furnaces as follows:

| | H. P. |
|---|---|
| Pottsville Iron and Steel Co., Pottsville, Pa. | 150 |
| Woodward Iron Co., Wheeling, Ala. | 292 |
| McCormick & Co., Harrisburg, Pa.—Paxton Furnaces | 416 |
| Lochiel Rolling Mill Co., Harrisburg, Pa | 416 |
| Total horse-power | 1,274 |

The following is a list of other sales made by the Babcock & Wilcox Company within the last sixty days:

| | H. P. |
|---|---|
| H. I. Kimball House Co., Atlanta, Ga. | 122 |
| Woodland Fire-Brick Co., Woodland, Clearfield county, Pa | 92 |
| Cincinnati, St. Louis, and Pittsburgh Railroad, Indianapolis, Ind | 146 |
| Louisiana Sugar Refinery Co., New Orleans, La. | 240 |
| Williamsburgh Gas Light Co., Brooklyn, E. D. | 164 |
| Pratt Manufacturing Co., Brooklyn, E. D. | 208 |
| Colwell Brothers, New York City, for export to Mexico | 122 |
| New Orleans Cotton Exposition, N. Orleans, La | 656 |
| Leonard Brothers, Plymouth, Pa. | 15 |
| G. Reynaud, New York City, for Ing″ o Santa Maria, Cuba | 73 |
| Ohio Edison Electric Installation Co., for Middletown, O | 92 |
| Oliver & Roberts Wire Co., Pittsburgh, Pa. | 416 |
| McCormick Harvesting Machine Co, Chicago. | 480 |
| Sperry Electric Light Co., Omaha, Neb. | 120 |
| Walter Aiken, Franklin Falls, N. H | 30 |
| A. H. McNeal, Burlington, N. J. | 104 |
| Lombard, Ayres & Co., Constable Hook, N. J. | 208 |
| Susquehanna Water Power and Paper Co., Conowingo, Md | 164 |
| Brooklyn Sugar Refining Co., Brooklyn, E. D. | 1,464 |
| American Bank-Note Co., New York City. | 240 |
| U. S. Naval Training Station, Newport, R. I. | 122 |
| Total | 5,327 |

## Machinists' Supplies and Iron.

New York, October 9, 1884.

There has been no change worthy of mention in the supply trade during the week. A fair volume of business is reported, but complaints are made that prices remain depressed.

The steam engine trade is quite active, and many builders are busy and working overtime. The depression in business is more marked in lines that handle railroad supplies than in any other. It was expected that by the time crops began to move, railroads would begin buying the supplies that have run behind, but little tendency in that direction has been exhibited.

Iron—The market for pig remains in the dull, unsatisfactory condition it has maintained for months. Consumers display no more inclination to depart from the policy of buying merely sufficient to meet immediate needs than they did at the beginning of the year. Standard brands of No. 1 X Foundry bring $19.50 to $20, but other makes can be bought $1 or 50c. cheaper. No. 2 X Foundry $18 to $19: Grey Forge, $15.50 to $16.50.

Scotch pig—The demand is moderate, with prices steady: Shotts $21.50 to $21.75, to arrive; Coltness $22, to arrive; Glengarnock $20.50, to arrive; Eglinton $19.50; Langloan $21.

Antimony—The market for Regulus has ruled quiet and prices steady. Hallett's brand brings 10c. and Cookson's 10¾c., but these prices can be slightly reduced for actual sales.

Copper—The demand for ingot has been light. Lake brings 13⅛c. to 13¼c., and other brands 12c. to 12¼c.

Lead—The market for common pig has ruled quiet, but firm. Sellers are asking 3 80c., but small sales have been made slightly below that figure.

Tin—A sharp decline abroad has made this market weak. For small lots, sellers hold for 18c., but lots over five tons have been sold at 17⅝c.

## ✻WANTED✻

*"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.*

First-class boiler maker wanted. Apply, with reference, to post office box 32, Columbia, S. C.

Wanted to go a year under instructions, in a shop where the best class of work is done. Address "Junior." Am. Machinist.

Wanted—A gear cutter, to cut up to forty inches diameter. New or second-hand. Address "Gear Cutter," Am. Machinist office.

Mechanical draughtsman, with shop experience, good designer, wants a situation. Address "Competent," Am. Machinist.

A fully competent man, who has held similar place over fifteen years, wants position as foundry foreman. M. C. L., Am. Machinist.

First-class mechanical engineer and draughtsman, with extensive experience as designer, superintendent, and salesman, is open to an engagement. Steam engineering a specialty. Best of references. Address "M. 100," Am. Machinist.

A first-class draughtsman, of twelve years' experience in shops and draughting-rooms, on locomotive and general machinery, wishes a re-engagement. Excellent references as to ability and steadiness. Address "Valve," Am. Machinist.

Wanted—By a thorough practical mechanical engineer, charge of machine works. Salary $2,500 per annum. 23 years' experience in firstclass works, in designing and building steam engines, shop tools, hydraulic machinery, printing presses, with extensive practice in special and general work. Good executive ability and business habits. Unexceptionable references. Address "Volens et Potens," Am. Mach.

For Sale—Richards-Elliott Indicator, in excellent condition, with five springs, scales, and details complete. Price $40. Address "Mechanical Engineer," 71 E. Eighth street, Covington, Ky.

Parties having unequaled facilities for both foundry and machine work, and having the best of tools, suitable for either light or heavy work, wish to take contracts to manufacture anything in the shape of machinery or patent specialties in metal. Address "Specialties," care Am. Machinist.


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No. 8 N. 21st St.,
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Manufacturers of
PATENT
Portable Drilling Machines
VERTICAL DRILLS,
RADIAL DRILLS,
MULTIPLE DRILLS, HAND DRILLS.

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Work quicker, open further, hold firmer, and are more durable than any other vise.—Sold by the trade (all Hardware and Machinery Dealers.) Send for Circular.
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SECOND-HAND.
One Putnam Screw-Cutting Engine Lathe,
42 Inch Swing, 26 feet bed, all complete, in fine condition.
Catalogues of New Machinery on Aprlication.

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FOR HARD COAL OR COKE.
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For Reducing and Pointing Wire.
Especially adapted to pointing wire rods and wire for drawing.
For Machines or information, address the manufacturer,
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PUMPING MACHINERY
FOR ALL DUTIES.
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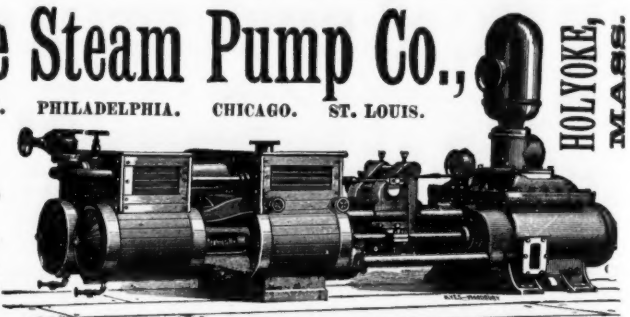

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**BEVEL GEARS,**
Cut Theoretically Correct.
For particulars and estimates apply to
BREHMER BROS.,
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Office THE DOMESTIC MFG. CO.,
Newark, N. J., Sept. 18, 1884.
Mr. JOHN C. BLEVNEY, Pres.,
The Blevney Mfg. Co., Newark, N. J.
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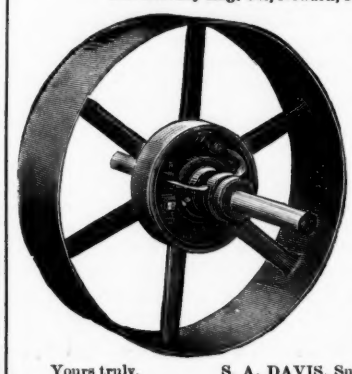

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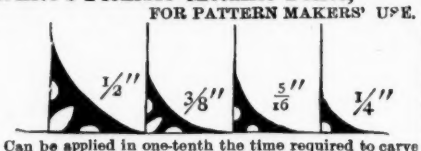
FOR PATTERN MAKERS' USE.




Can be applied in one-tenth the time required to carve curved fillets. Send for sample. H. B. Smith Machine Co., Mfrs. of Wood Working Machinery, 925 Market, Phila.

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The following extra heavy machine tools:
1 8'x8'x16' Planer. Double Head with 1 interchangeable Side Head.
1 48" swing x14' Forge and Roll Turning Lathe.
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1 Double Column Universal Drill Press. Two Heads.
Above Tools all new and for immediate delivery.
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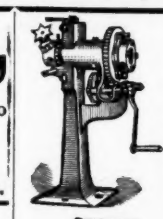

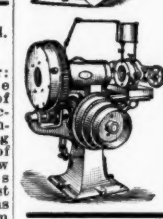

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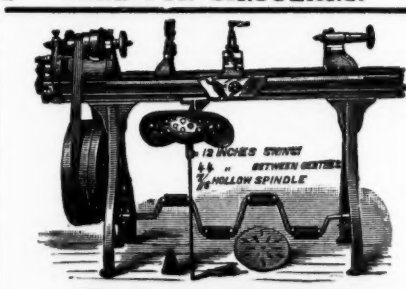


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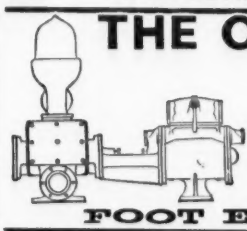

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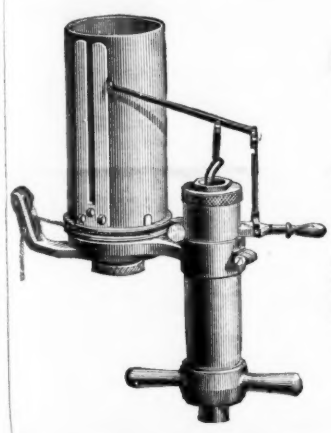

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Office BALL ENGINE Co., Erie, Pa.
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*Gentlemen:*—We are still using the **TABOR INDICATOR** purchased of you. Most of our work is HIGH SPEED, from 300 to 350 revolutions per minute. With these conditions we are able to get very SATISFACTORY results, which certainly speak well for the Indicator.
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Sizes made from $\frac{7}{8}$ to $3\frac{7}{8}$ inches, advancing by sixteenths.
Price lists, with references and other information, furnished on application.
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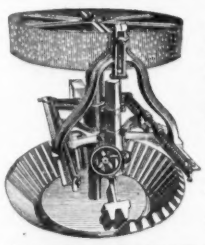
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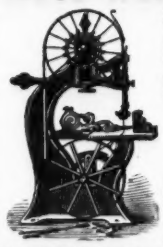
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| " 3, | 1 | " | .80 | " 12, | 3 " | 1.80 |
| " 4, | 1⅛ | " | .95 | " 13, | 3½ " | 2.00 |
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| " 6, | 1⅜ | " | 1.10 | " 15, | 4½ " | 3.00 |
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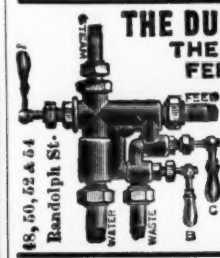

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Not liable to get out of order. Will lift Water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by
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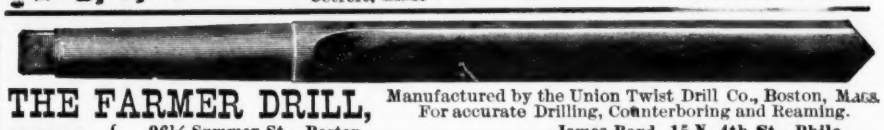
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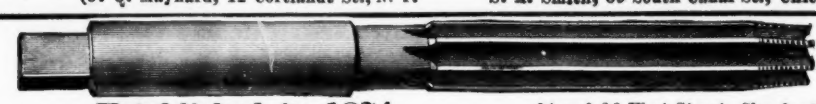
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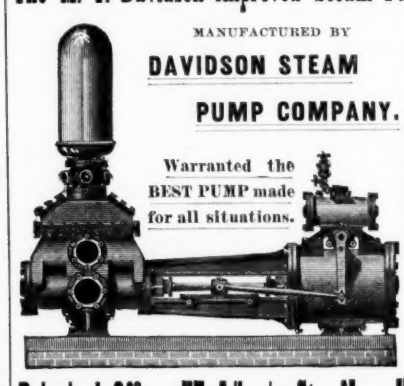
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Warranted the BEST PUMP made for all situations.
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Sole Manufacturers of H. W. Johns'
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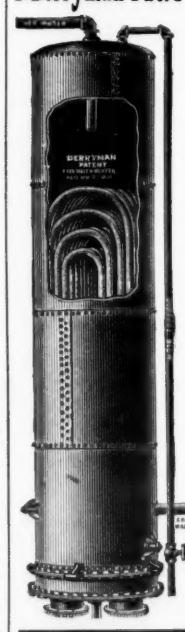
Descriptive Price Lists and Samples free.

**THE Berryman Pat. Feed Water Heater & Purifier**

Manufactured by
**I. B. DAVIS & SON**
HARTFORD, CONN.
Has seamless drawn brass tubes. The U shape of the tube prevents their being affected by expansion or contraction.
**This Heater has been in constant use Ten Years.**
None have ever required repairs. Gives the highest results attainable by the use of exhaust steam.
IT IS ALSO THE ONLY HEATER APPLICABLE TO CONDENSING ENGINES, increasing the vacuum and imparting a high degree of heat to the Feed Water.
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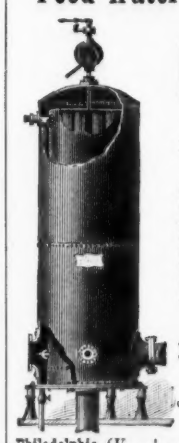
**The Baragwanath Steam Jacket Feed Water Heater and Purifier.**

Manufactured by the
**Pacific Boiler Works,**
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Best Feed Water Heater in the World.
Delivers feed water several degrees above boiling point. Reduces back pressure on engine. Prevents and removes scale and incrustation from boilers. Not affected by expansion or contraction. Saves fuel. Increases the steaming capacity of boilers, and saves boiler repairs.
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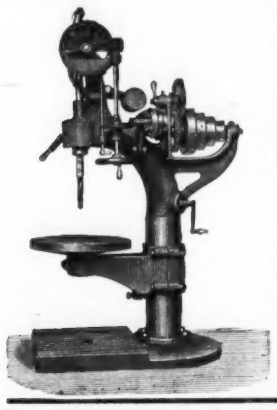

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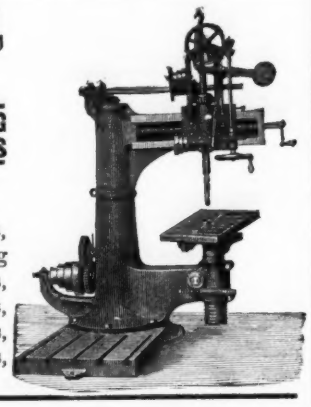

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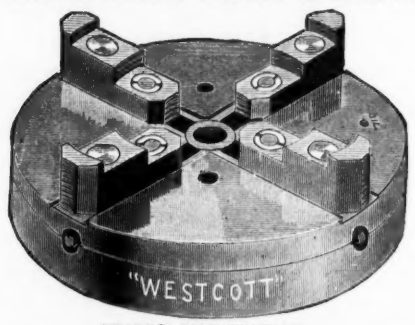

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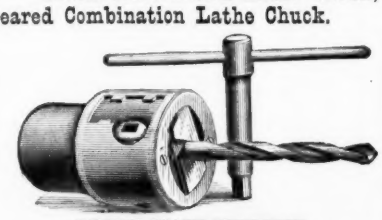
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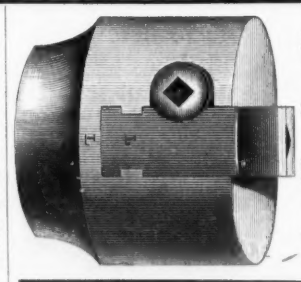

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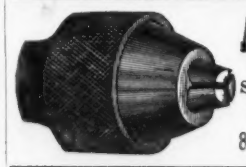

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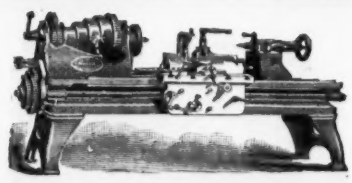

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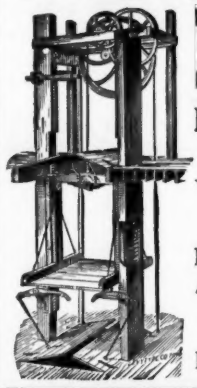

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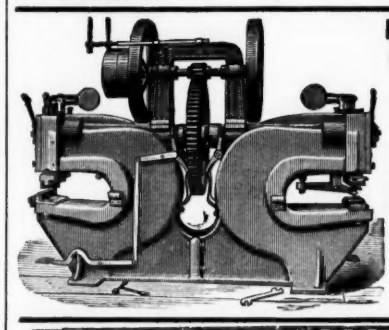

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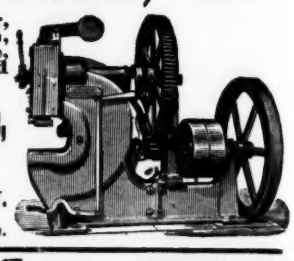

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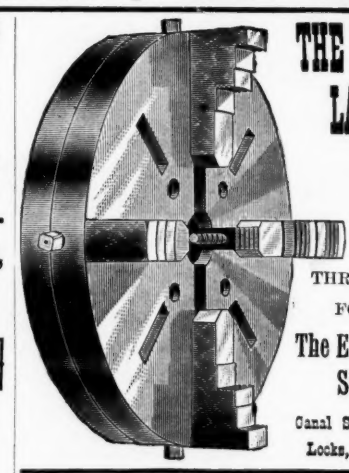

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FOR
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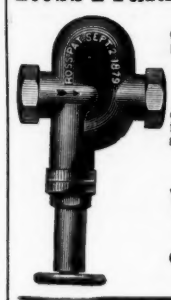

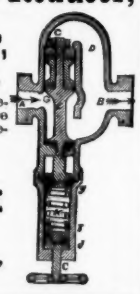

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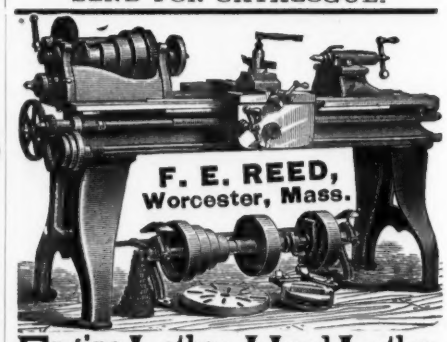


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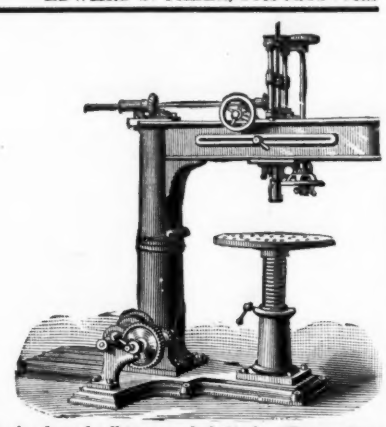

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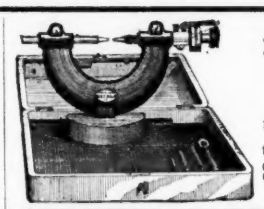

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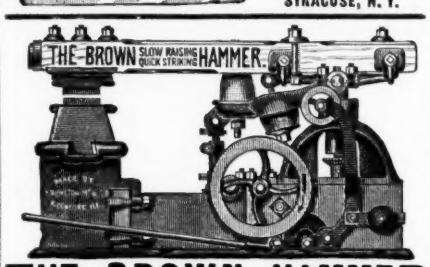


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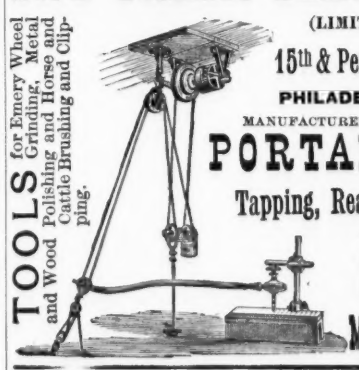

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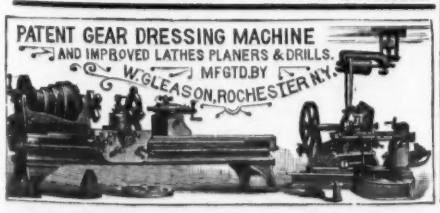


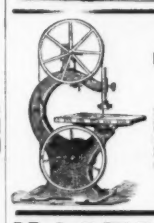

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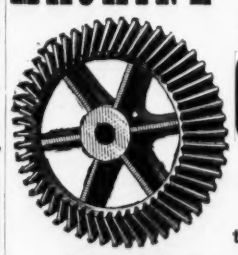

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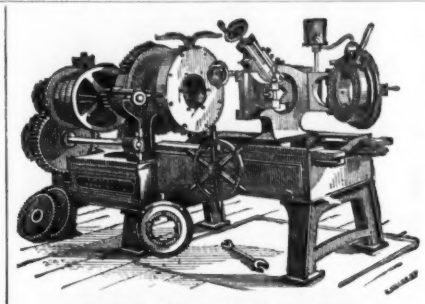

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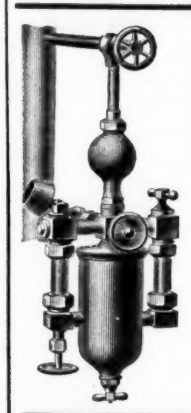

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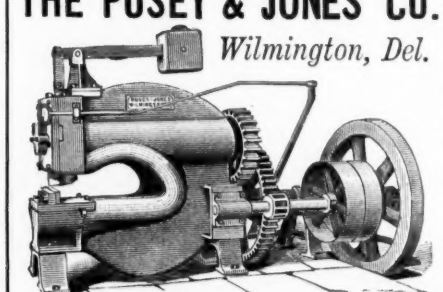

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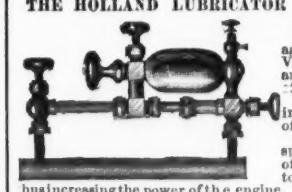

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Yours truly,
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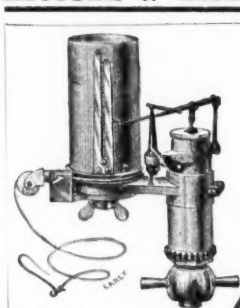

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Gentlemen—Agreeable to your request of this date, as regards my opinion of the merit of the Thompson Improved Indicator, I unhesitatingly reply that during two years' practice with it and other classes of instruments, I have always found the Thompson to be thoroughly reliable. Even under what is known as high speeds, say 100 feet per minute, or locomotive practice, and as long as it continues its present high state of perfection, I shall consider it an important adjunct to an engineer's outfit.

G. W. COOPER, M. E.

Engineers allowed special terms.

**STENOGRAPHERS** furnished business men without charge for my services. Correspondence solicited. **SHORTHAND** taught by mail or personally.

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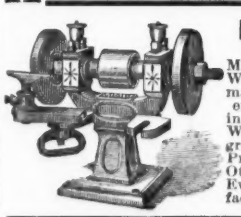

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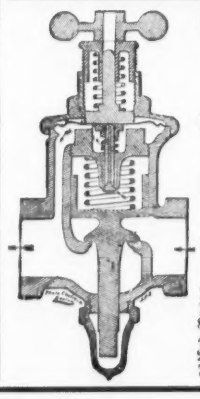

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Manufactured by

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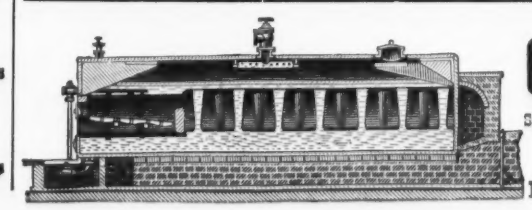

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Safety—Economy in Fuel—Low Cost of Maintenance—Dry Steam without Superheating.

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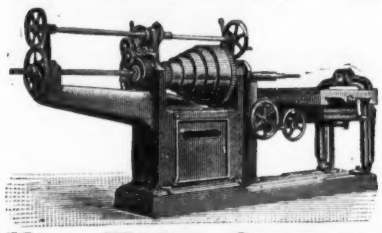

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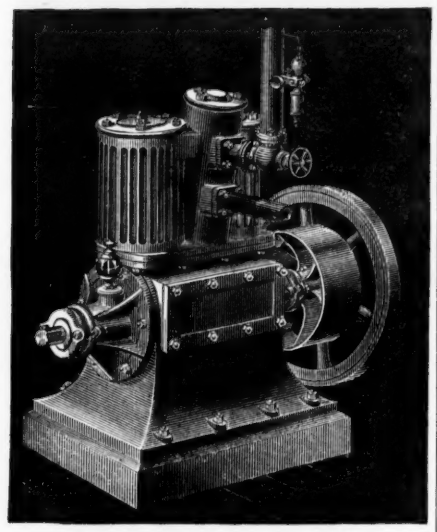

Rear view, showing one wheel removed.

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**900 ENGINES**

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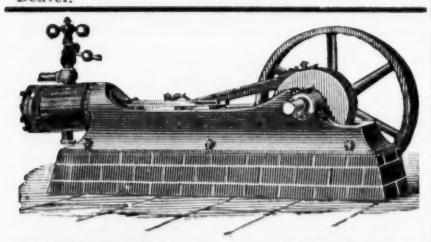

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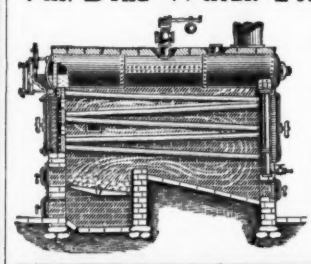

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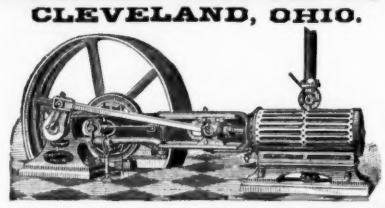

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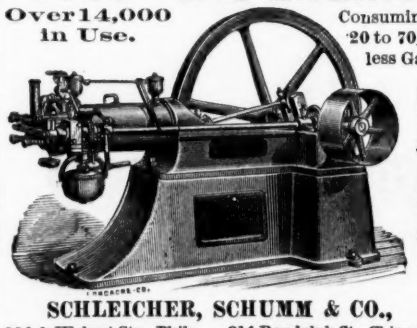

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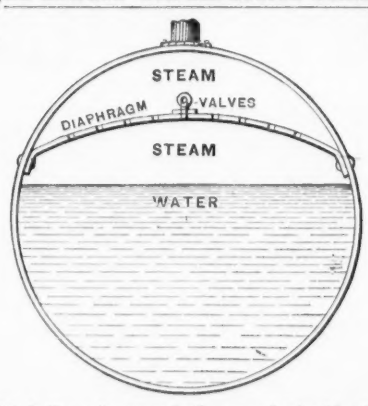


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guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

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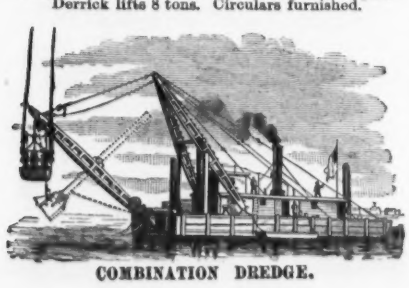
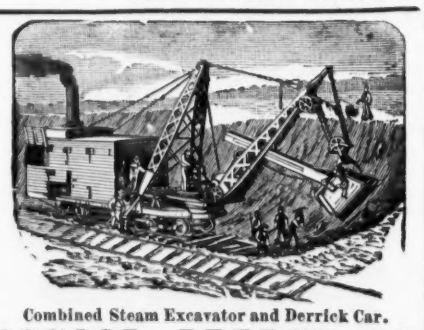


COMBINATION DREDGE.



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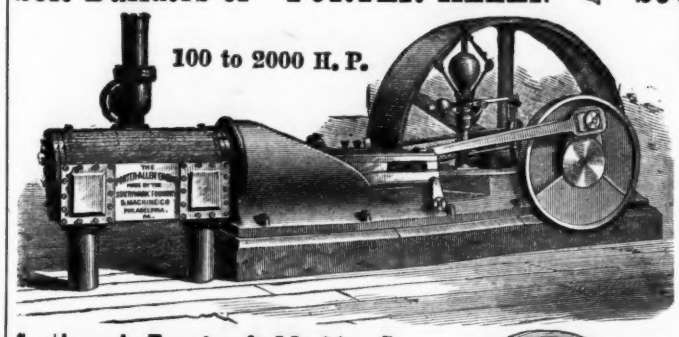
100 to 2000 H. P.



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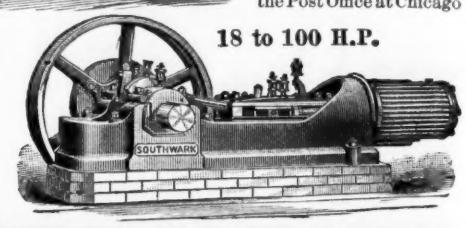


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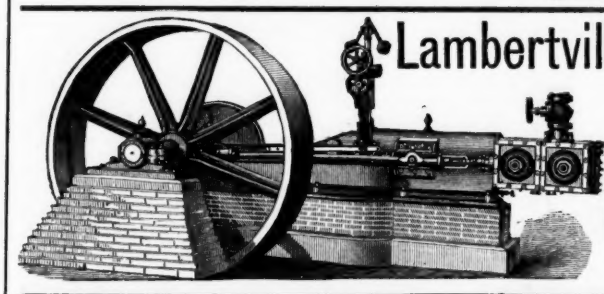

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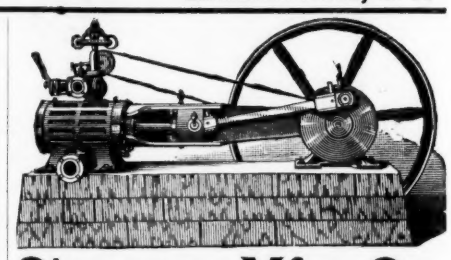

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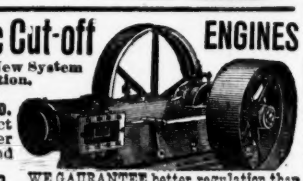

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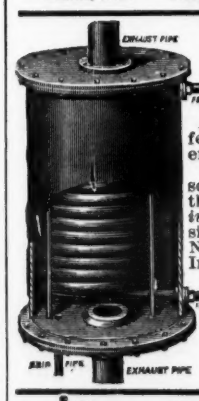


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Teeth cut diagonally, Grips Round Iron or Pipe.

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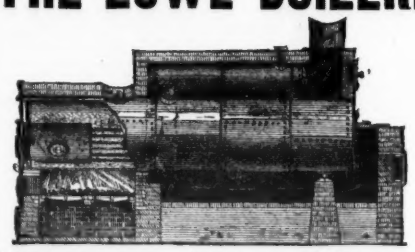

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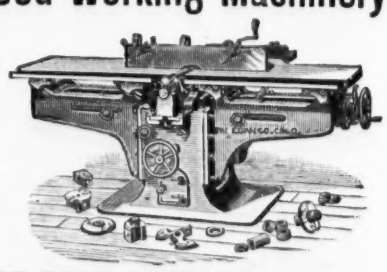

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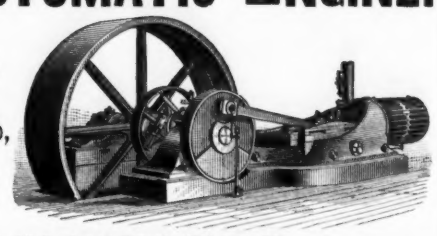

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**PATENTS!** Thomas P. Simpson, Washington, D. C. No pay asked for patent until obtained. Write for inventor's guide.

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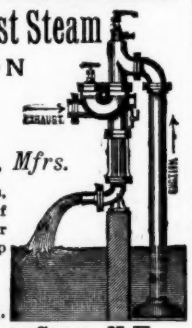
*L. SCHUTTE & CO., Mfrs.*

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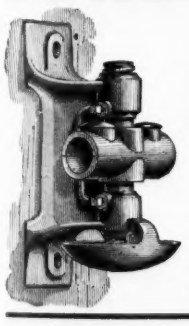

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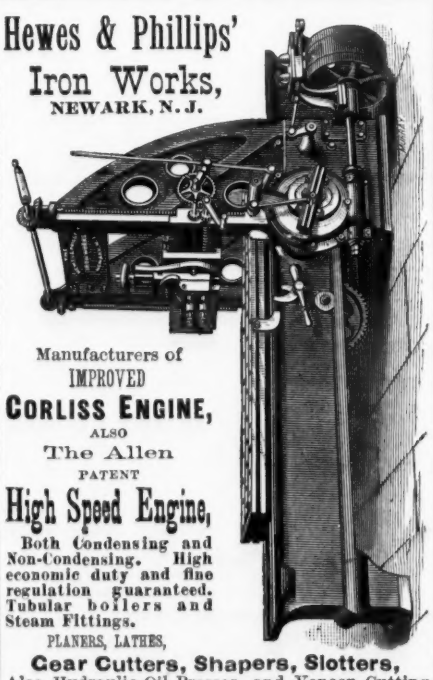

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Both Condensing and Non-Condensing. High economic duty and fine regulation guaranteed. Tubular boilers and Steam Fittings.

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HEAVY PLANERS A SPECIALTY.

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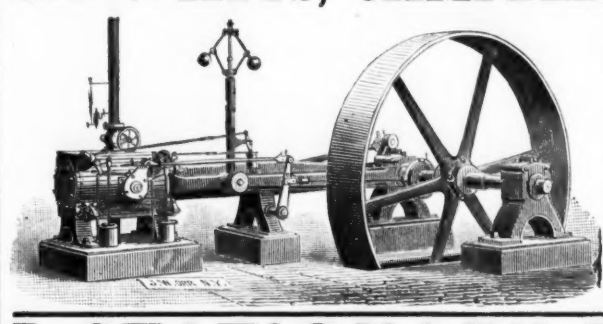

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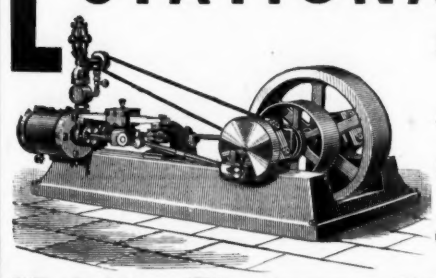

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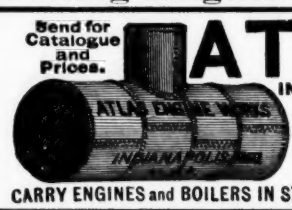


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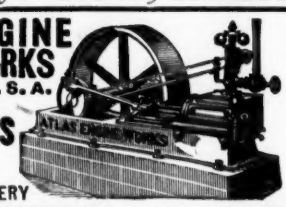


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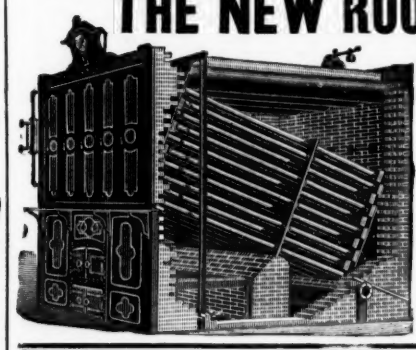

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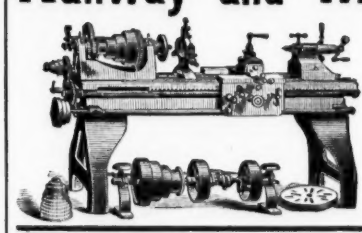

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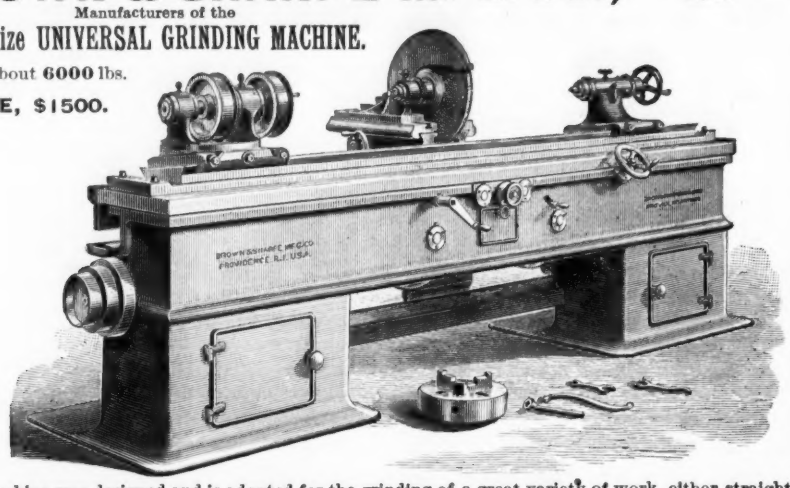

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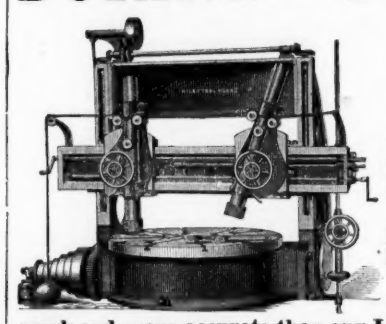

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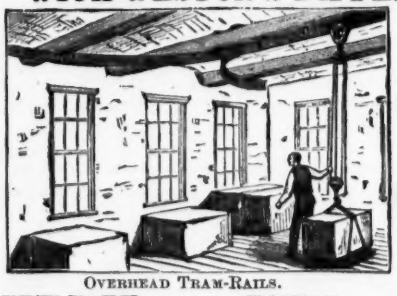

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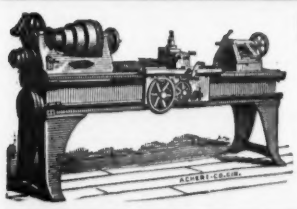

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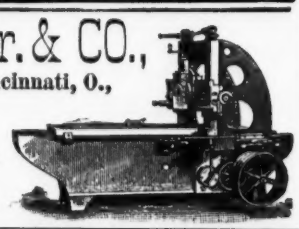

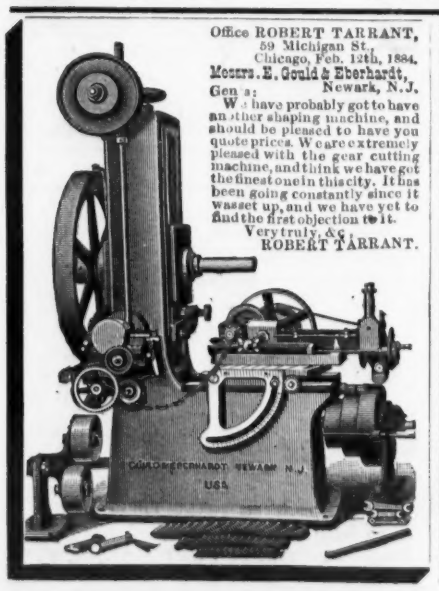

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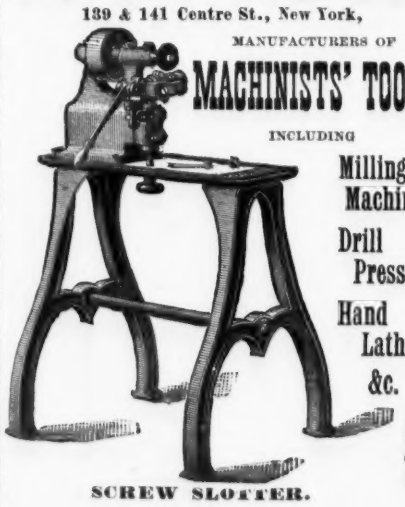

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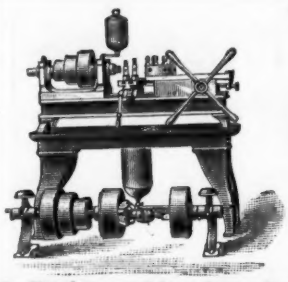

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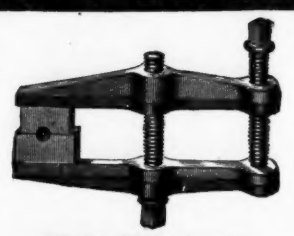

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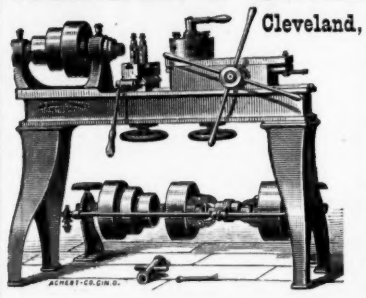

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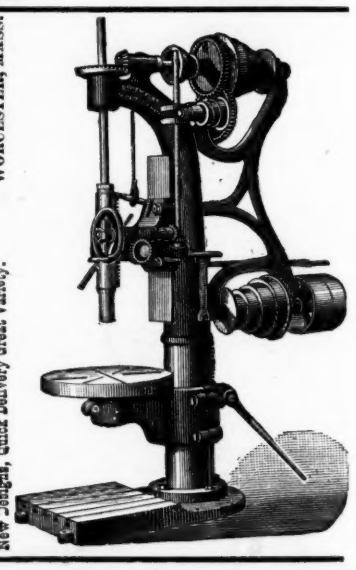

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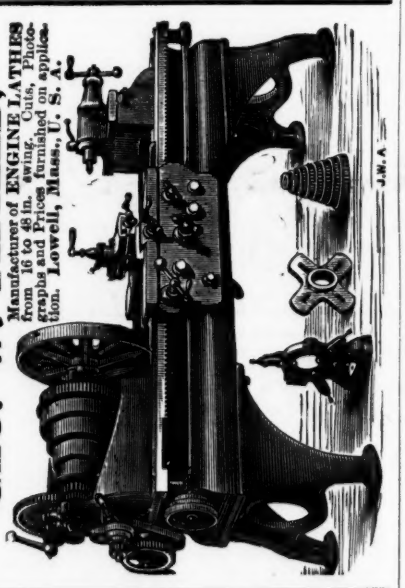

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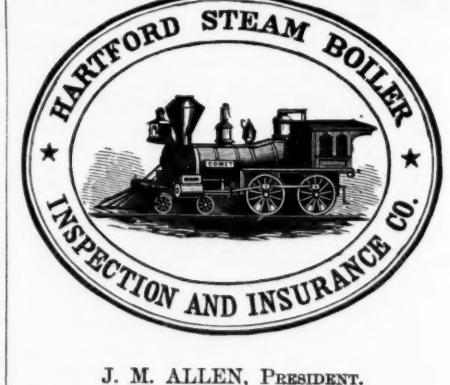

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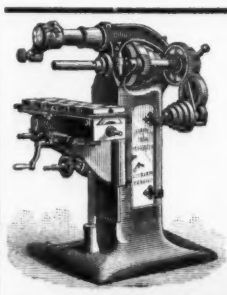

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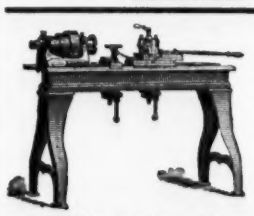

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